A STUDY OF PERCEIVED TECHNICAL COMPETENCY AREAS NEEDED BY TECHNICAL DRAWING TEACHERS AT THE SECONDARY SCHOOL LEVEL IN DELTA AND EDO STATES

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ABSTRACT

The study was designed to identify technical drawing competencies which are important for successful teaching of Technical Drawing as a subject at the secondary school level in Delta and Edo States. Also, the study identified competencies needed for in-service training. Three research questions and one hypothesis guided the study. The design of the study was an ex-post facto survey with a study sample of 56 Technical Drawing teachers. Questionnaire was used for data collection. mean, t-test and Analysis of Variance (ANOVA) were used for data analysis. The findings revealed that 26 competencies are important for effective teaching of Technical Drawing at the secondary school. Furthermore, the teachers indicated high performance on 17 competencies and moderate/low performance on 9 competencies. Recommendations were made based on the findings.

INTRODUCTION

The quality of education depends to a large extent on the quality of the teachers. The modern technological age with its accompanying explosion of knowledge calls for teachers who are ready to keep abreast of the

constant changing needs of individuals being taught as well as that of the society.

The Technical Drawing teacher occupies a crucial position in the education process. The content he/she teaches must reflect the latest trends and practices in technical education as well as the newest developments in technology and industry. The teaching of manufacturing processes, dimensioning, tolerancing, threads and fasteners, gearing and cams ought to conform with the latest international standards (Earnett, 1974).

Drawing is taught at secondary and tertiary levels with the purpose of training technically literate workers for industry, who can read drawings and work with them. Drawings explain the arrangement of machines and building projects. The increased usage of computer technology for drafting, design work and manufacturing processes must reflect in a Technical Drawing course. (Giesecke, Mitchell, Spencer, Hill and Dygdon, 1986).

This is as a result of the increasing impact which computer technology has on the traditional approaches to manufacturing processes and to drafting and design techniques.

Finch and Crunkilton (1985) contended that the current trend in curriculum planning is to make the content of a technical education programme reflect the demands of the workplace. This demands that teachers acquire periodic training on the job for effective performance of their duties. The curriculum is not static but keeps constantly changing. New topics are being integrated and new methods of instruction are being developed. As a result, there is the need to determine technical competency areas for inservice training for Techical Drawing teachers. An approach is to identify the professional development needs of the teachers in general

and then provide a structure to satisfy these needs for the teachers within its geographic area. The in-service is to update content and methods in the traditional areas and also provide for experiences in computer as a valuable tool in the preparation of Technical Drawing.

The study was therefore designed:

1. To identify the Technical drawing competencies considered important by post-primary Technical Drawing teachers in Delta and Edo states.
2. To find out technical competencies pos sessed by the teachers and
3. To identify those competencies in which the teachers need in-service training.

The null hypothesis tested in this study was: There is no significant difference among teachers' mean scores for expressed performance level of Technical Drawing competencies with regard to their years of teaching experience. ($P < .05$).

METHODOLOGY

Population and Sample

The area of the study was Delta and Edo States of Nigeria, and the population was made up of all qualified post-primary school Technical Drawing teachers in the area of the study.

These teachers were made up of 23 in Technical Colleges and 33 in Secondary Schools (17 NCE-Technical; 12 C & G Final + TTC; 11 B.Sc - Technical; 10 ND; and HND). The entire population was involved in the study. There was no sampling because the population was not Large.

INSTRUMENT OF THE STUDY

Questionnaire was the instrument for the study. It was developed from performance objectives in the Technical Drawing syllabi for senior secondary school and National Technical Certificate curriulum and module specifications. Items and ideas on the use of computer Aided Design (CAD) system were generated from Literature reviewed and interviews with professionals in technical education. Each structured item had a 5-point scale with a code assigned to each degree of importance and performance level as follows:

DEGREE OF IMPORTANCE	PERFORMANCE LEVEL
1 = Not important	1 = Low performance
2 = Little importance	2 = Below average peformance
3 = Average importance	3 = Average perfomance
4 = Slightly above average	4 = Slightly above average
5 = High importance	5 = High performance

The instrument was face validated by two measurement and evaluation experts, one psychologist and four Industrial Technical educators. It was revised according to suggestions by the validators. Reliability of the instrument was established by the test-retest procedure whereby it was administered to the same subjects twice with a time lag of two weeks. Correlation analysis (using Rank difference correlation ratio(R)) of the two sets of data obtained yielded a coefficient of 0.94 for the importance column and 0.93 for performance column. The internal consistency of the Technical Drawing Instrument was 0.85 using the Cronbach alpha (&). Each teacher was asked to indicate the relative importance of each competency as well as their individual level of performance of each competency.

Data Collection Technique

The distribution of the questionnaire and collection of data were carried out by the researcher and trained research assistants. 53 questionnaires were completely filled and returned for analysis after a period of three weeks.

Data Analysis Technique

Data was analysed using means, t-test and ANOVA at 0.05 level of significance. The mean was used for determining the competencies important to Technical Drawing teachers. Competencies equal to or greater than 3.5 were considered important while the performance level at this value was considered to be above average. The mean importance and mean performance scores were correlated using multiple correlated t-test. Any item that is statistically significant constitutes a need. The hypothesis considered the effect of years of teaching experience and was tested using the Analysis of Variance (ANOVA).

FINDINGS AND DISCUSSION

The list of competencies perceived as important for effective teaching of Technical Drawing and the expressed performance level of the teachers is as shown in Table 1. Data on the tables revealed that the Technical Drawing teachers expressed high performance level on 17 competencies by scoring 3.50 and above on them (seeTable 1). These competencies fall under seven clusters which are Geometrical construction, Loci, Freehand Sketching, Descriptive Geometry, Sectional Views, Development and Machines/Building Drawing.

Table 1

Comparison of Level of Importance and performance for Needs of Technical Drawing Teachers

Item	Competency	Perceived Import-ance	Expressed Perform-ance.	Calculated t-Value
	Geometrical Construction			
1.	Dividing a line into any given ratio.	4.80	4.32	3.78
2.	Constructing and reading plane scales.	4.73	4.11	5.28
3.	Reducing or enlarging to scale a given plane figure.	4.75	3.91	6.62
	Loci			
4.	Constructing ellipse, parabola and hyperbola.	4.73	3.93	4.79
5.	Constructing helix, involute and cycloid curves.	4.59	4.00	4.85
6.	Solving problems involving simple link mechanism.	4.45	3.69	3.62
	Freehand Sketching			
7.	Making isometric sketches of simple objects.	4.49	4.18	5.12
8.	Making oblique sketches of objects.	4.16	3.89	4.83
9.	Making perspective pictorial sketches of building details.	4.48	3.75	4.52
	Descriptive Geometry			
10.	Locating points and lines in space	4.23	3.41	5.22
11.	Drawing projected views of inclined lines on principal planes.	4.45	3.69	4.48
12.	Determining the true length of a line in space.	4.50	3.66	5.43
13.	Determining the true angle of inclined lines to the principal planes.	4.32	3.66	4.09

Item	Competency	Perceived Importance	Expressed Perform-ance	Calculated t- Value
	Sectional Views			
14.	Drawing of sectional views of cutting plans.	4.48	3.77	4.15
15.	Projecting 1st and 2nd auxilary plans from normal views.	4.52	3.39	7.06
16.	Projecting 1st and auxilary elevations from normal views.	4.54	3.30	6.04
	Development			
17.	Auxiliary projection of prism cut by inclined Plane.	4.29	3.27	5.41
18.	Development of right and oblique prism.	4.59	3.80	5.39
19.	Development of intersecting squares, hexagonal prism meeting at right angles.	4.45	3.63	4.80
20.	Development of intersecting cylinder.	4.50	3.93	4.25
	Machines/Building Drawing			
21.	Constructing machine part in angular or two point perspective from orthographic views.	4.43	3.34	6.03
22.	Constructing detailed drawing of machines components.	4.41	3.29	5.65
23.	Constructing and dimensioning of sectional orthographic view/models of machine part.....	4.54	3.70	5.16
24.	Using auxilary plane method to determine the line of intersection of two surfaces e.g. cones.....	4.50	3.34	5.84
25.	Constructing detailed drawings of residential building.....	4.41	3.04	7.99
	Computer Aided Design and Drafting			
26.	Using computer to create and store original drawings.....	3.51	1.80	8.22

The teachers indicated low performance on nine competencies. The items are 10, 15, 16, 17, 21, 22, 24, 25, and 26. These competencies have been identified as being important for effective teaching of Technical Drawing.

The study identified 9 Technical Drawing competencies in which the teachers need in-service training. **These are as follows:**

1. Using computer to create and store original drawings.
2. Constructing detailed drawing of residential building.
3. Projecting 1st and 2nd auxiliary plans from normal views.
4. Projecting 1st and 2nd auxiliary elevations from normal views.
5. Constructing machine part in angular or two point perspective from orthographic views.
6. Using auxiliary plane method to determine the line of intersection of two surfaces e.g. cones.
7. Constructing detailed drawing of machine components.
8. Auxiliary projectors of prism out by inclinedplane.
9. Locating points and lines in space.

A breakdown shows that there is one in Descriptive geometry, two in Sectional views, one in Development, four in Machine/Building drawing and one in computer aided design and drafting. The findings agree with the position of Itotoh (1989), Ristow (1988), Oranu (1985) and Aina (1981) that teachers need training to improve the teaching learning process. The Technical Drawing teachers possess at least two-third of the competencies needed for effective Technical Drawing teaching.

The data analysed for the hypothesis of the study is presented in Table 2.

Table 2.

ANOVA of Respondents Mean Scores on Technical Drawing Competencies

Source	Sum of Squares	D.F	Mean Square	F-ratio	Critical F
Between Groups	4.68	1	4.68	1.106	2.99
Within Group	215.63	51	4.23		
Total	220.31	52			

ANOVA test was used to determine whether or not there were significant differences in the mean scores in the Technical Drawing competencies with regards to teachers teaching experience. The calculated F-ratio value of 1.11 is less than the table value of 2.99 which is required for significance at 0.05 confidence level. This indicated that there was no significant difference among the three groups of experiences used in the study. The null hypothesis was accepted. This implies that teachers with long years of teaching experience (above ten years) do not have better performance on Technical drawing competencies when compared with teacher whose experience are 'Low' (0-5, and 6-10 years).

CONCLUSION

The concept of in-service education of teachers which is to bring them up-to-date with new curriculum content and development of specific technical skills and competencies seems justified. Curricular changes are becoming widespread, and teachers both in the field and those entering the field are often ill-prepared to

cope with these changes.

The traditional tools of the building or engineering drawing have been the drawing board and an array of drawing instruments. In recent years, the conventional drawing equipment is now being replaced by another tool called a computer. The computer - aided design (CAD) or the computer - aided manufacturing (CAM) enables the Technical Drawing teacher/Architect/Engineer to create, revise and store drawings with relative ease, utilizing less space (Giesecke, F.E. et al 1986). This leads to increased productivity and cost effectiveness. Tedious and repetitive tasks become automated as a result of the new development.

It is expected that an in-service programme that is based on the findings of this study will equip Technical Drawing teachers with necessary technical skills and knowledge needed to teach the subject effectively at the secondary school level. As a result, students' standard of achievement in internal and external examinations will improve.

The following recommendations are made based on the findings and conclusions of this study.

1. The Science, Vocational and Technical Division of the Ministries of Education should provide in-serv ice education for Technical Drawing teachers to update and upgrade their knowledge and skills.
2. All the nine competencies in which teachers ex pressed low performance should be given top priority in the inservice programme.
3. The curriculum planners should incorporate all Technical drawing competencies identified as important into the existing curriculum for preparing technical teachers in colleges of Education - Technical, Polytechnics and Universities.

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