

Factors that affect the effective teaching and learning methodologies of technical drawing in technical and vocational schools (in the case of East Gojjam zone technical and vocational schools)

Mulatu Mengistayehu Workie

School of Mechanical and Industrial Engineering, Debre Markos University, Debre Markos, Ethiopia

ABSTRACT -This study was conducted to identify the challenges of effective teaching and learning of technical drawing in technical and vocational schools. The study adopted descriptive survey research design guided by four research questions which were formulated to guide the study and used for data collection. The population size was selected randomly. Also seventy two (72) questionnaire instruments were administered to the respondents who formed the population of the study. After the data collection was presented in percentage tables after the questionnaires were filled and returned. The study revealed that most technical teachers use traditional methods during teaching and learning of technical drawing instead of practical teaching methodologies. Also adequate drawing equipment's and good learning environment makes the students learn technical drawing better and easier. Study also revealed that the students' interests are positive and usually very high when drawing materials and equipment are available and adequate. Based on the findings of the study, recommendations were made.

Keywords— Effective Teaching, Teaching methodologies, Technical Drawing, Technical and Vocational Education

1 INTRODUCTION

Education which is a means of producing desired changes in the behavior of people primarily, involves the process of teaching people to learn what is designed for them. Education occurs in the formal system like senior high schools where knowledge and understanding of particular subjects are provided [1]. This means that "teaching" is one of the most essential facets of formal education. Teaching therefore plays an indispensable role in education because it serves as a medium for transferring knowledge from generation to generation. Education, particularly science and technology education is the factory for the production of the needed technologists, technicians and craftsmen as well as skilled artisans who are required to turn the nation's economy positively.

Modern education was introduced to Ethiopia nearly a century ago. However, the education and training offered during these long years had limited positive impact on the lives of the people and national development. The education offered has not enabled to solve the problems of farmers, pastoralist, and change the lives of the over whelming majority of the people [2].

In the first half of the 20th century, the development of vocational and technical education in our country, for instance, was very limited (Grade 10+3) and that it was not given sufficient attention or policy support. There were only sixteen institutions that offered vocational and technical education with an annual intake of not more than 1,000 students. As the quality of education was not high enough, the trainees' contribution to the country's growth was far below expectations [2].

Since the imperial period, different policies were enacted to introduce technical and vocational schools in Ethiopia. As in many other African countries, it was considered as second-class education. When vocational education and training was introduced, its objective was to improve the attitudes toward skilled, manual work, and thus diverts at least some young people from seeking the white - collar jobs that were increasingly in short supply, rather to encourage young people to remain in the rural areas where they could contribute to the economy by participating in agriculture. In 1970s, selected high schools were converted to comprehensive high schools where students could have both academic and vocational education. Since 1994, technical and vocational schools has become an integral part of the whole education ecosystem.

In recognition of the critical role it played in emerging economies, the Ethiopian government has been pronouncing the importance of technical and vocational schools to implement growth and transformation plan and invested significant financial and human resource to improve access, quality and relevance of the technical and vocational schools programs [3].

It is generally accepted that science, technology and manufacturing contribute to economic growth and development of nations. As a result, most developing nations soon after gaining independence introduced Technical and Vocational Education and Training programme in their school systems with the hope of accelerating industrialization to promote economic growth. However, the initiatives have also not had significant

impact on skill acquisition and on the national level of production.

Acquisition of appropriate scientific and technological skills is necessary to cope with the challenges presented by the evolving needs of effective teaching of technical drawing in East Gojjam Zone technical and vocational Schools. Education and training system that responds adequately to these demands will therefore contribute to the hard works to overcome the growing unemployment and marginalization of majority of the populace. By providing access to appropriate teaching experience designed to broaden skills and knowledge can increase productivity and significantly improve the fortunes of the unemployed, thereby reducing poverty and unemployment among Ethiopian youth.

Within the context of technical education, technical drawing has been identified as a very important science subject and its importance in scientific and technological development. Moreover, it was as a result of the recognition given to technical drawing in the development of an individual and the nation that it was made a core-subject among the natural sciences and other science related courses in Ethiopian educational system.

All education institutions emphasize that teaching is important and it gives high priority to developing effective teaching and solving teaching challenges. Effective teaching may include high level of creativity in analyzing, synthesizing and presenting knowledge in new and effective ways. It should instill in the students the ability to be analytical, intellectually curious, culturally aware, employable, and capable of leadership.

Teaching is an art and the equality of teaching depends on the love, dedication and devotion of the teacher towards the subject of the knowledge. The quality of any teaching program cannot rise above the quality of teachers, teaching is a highly individualized activity, and the student-teacher interaction is an intense human relationship that encompasses a broad range of personalities and behaviors [4].

There is no best or most effective teaching style, which will work well for all teachers. Many new teachers attempt to initiate the style of a favorite teacher from the past, but the most successful style is those that develop as naturally as possible from a teacher's own personal characteristics. The most effective teaching style for a teacher will be one that reflects a combination of sound teaching techniques, knowledge of the subject, enthusiasm for teaching and sensitivity to another's personal characteristics. Whatever style a teacher adopts, he/she can generally perform in a more relaxed manner if he/she simply maximizes his/her own best personality traits. In general, if a teacher comes across his/her students as a caring person, their appreciation for the teacher's personal sincerity will enhance their impression about the teacher [5].

The field of technical drawing encompasses work done by

architects, engineers, interior designers and electricians, technical drafters to develop spatial intelligence, imaginative and drawing skills so that they would become creative and helps to solve many of the social, economic and professional problems that need designs before production [6]. Technical drawing/graphic is a medium of communication among technologist, engineers, architectures, technicians and so on and is widely used in many fields and professions. In general, it provides necessary information about the shape, size, surface quality, material, tolerance, manufacturing process etc., of the design [7].

A drawing is a graphical representation of objects and structures and is done using freehand, mechanical, or computer methods. Drawings may be abstract, such as the Multiview drawings shown in, or more concrete, such as the very sophisticated computer model shown in. While, Technical drawing is used to represent complex technical ideas with sufficient precision for the product to be mass-produced and the parts to be easily interchanged [7]. Technical drawings have been used to communicate ideas from ancient times to the modern era. As the vernacular of industry, technical design, drafting and drawing are essential to the curricula of all technology engineering and design programs [7].

Drawing was the first means of expression and representation invented by man, when he drew on walls of prehistoric caves and it is still extremely valid both as an artistic representation of reality and as a means of expressing pure imagination. To be able to draw means above all, to be able to "see", to understand rationally, to feel emotions and to master the techniques which fully allow us to express our thoughts and moods [8]. Drawing is "the art or skill of making pictures, plans etc. with a pen or pencil or a picture that you draw with a pencil, pen, etc." [9].

Technical drawing as a universal graphic language that has been refined over time and has embedded within it aspects and knowledge of symbolic, cultural, utility, cognitive nature, much as any language, literacy and communication. There are the conventions, shared community processes and recognized applications of any developed language. This is a physical mode which aids cognition and through which visualization and innovative problem solving can be made explicit. As with any language it helps one to share ones thoughts with others or clarifies and articulates one's own thinking [10].

There are different teaching methods that one can use to teach drawing. This are the lecture, demonstration, discussion, role playing and hands on (experiential) methods as appropriate method of teaching but also suggests that the lecture method is more convenient for listening learners (auditory learners) since it grants a two way communication for both learners and teachers. The demonstration method is recommended for practical courses such as drawing. This means that, the demonstration method suits students who wish to acquire skills, because learners are able to see the tools, materials, supports, equipment that are needed for the task as well as observe their use and partake in doing the tasks associated

with them. All in all, the demonstration method allows learners to be creative and grow at their own pace given that they will be assigned works to do on their own after being shown how to do them [11].

Mulatu Mengistayehu is currently working as Lecturer in Mechanical and Industrial Engineering school in Debre Markos University, Ethiopia, PH-+251 910 30 21 52. E-mail: mulatumengistayehu@mail.com

2 STATEMENT OF THE PROBLEM

In spite of the efforts of the Ethiopian government to improve technical education program, majority of students in the technical and vocational schools still perform low in technical drawing classes and examinations.

There are numerous problems associated with drawing that are quite common to technical and vocational schools. So, students are facing numerous challenges in drawing class and examinations. Engineering and technology cannot have base in Ethiopian without technical drawing and if students continue to perform poorly in the subject, our engineering and technology base will probably be unable to attain the lead found in other nations of the world. It is necessary to identify those challenges to effective teaching and learning of technical drawing in East Gojjam zone, Ethiopia and possibly recommend solutions based on the findings of the study.

This implies that technical drawing knowledge and skills are fundamental to all careers in technology education, but as may be observed technical teachers are constraints to teach these knowledge and skills to the students as teachers and students still employ absolute tools, equipment and activities in the teaching learning process [12].

3 OBJECTIVES OF THE RESEARCH

3.1 General Objective

The general objective of this study was to identify the factors that affect the effective teaching and learning methodologies of technical drawing in technical and vocational schools.

3.2 Specific Objective

The study focuses on;

- To assess the methodologies that adopted in teaching technical drawing.
- To assess the availability and adequacy of instructional facilities for teaching of technical drawing.
- To assess the attitudes of students in learning technical drawing.
- To assess the suitability of instructional facilities for teaching of technical drawing.

4 RESEARCH QUESTIONS

The following research questions were formulated to guide

the study;

- What are the methodologies that adopted in teaching technical drawing?
- How the availability and adequacy of instructional facilities for teaching of technical drawing?
- How positive are the attitudes of students in learning technical drawing?
- What are the suitable instructional facilities for teaching technical drawing?

5 RESEARCH METHODOLOGY

The study adopted survey design, because it would elicit the opinion of the respondents on the factors of effective teaching methodologies of technical drawing in East Gojjam zone technical and vocational school. Survey research is the research design that employs the study of large and small population of the research to discover the incidence, distribution and interactions of sociological variables.

The study was conducted in four Technical and vocational schools in East Gojjam zone, Amhara region; Ethiopia. This are Motta technical and vocational school, Debre Markos Technical and vocational school, Bichena technical and vocational school, and Amanuel technical and vocational school and the respondent population of the study comprised of Senior Students, School Principals and Technical Drawing Teachers in the selected Technical and vocational schools.

Instrument used for data collection was structured questionnaire. The instrument was validated and seventy two (72) questionnaire instruments were administered to respondents and all were returned to the researcher. Data collected was presented in percentage tables. Random technique was used and the sample comprised senior students and teachers from each of the technical and vocational schools selected for this study. Therefore, a total of 72 people were randomly interviewed as resource persons and at the same time given questionnaires to answer for the study.

Research Question1: What are the methodologies that adopted in teaching technical drawing?

Table 1: *Percentage responses on the methodologies that adopted in teaching technical drawing in technical and vocational schools in East Gojjam Zone.*

From table 1, 72.36% respondents agreed that most technical teachers use traditional methods of teaching during teaching and learning of technical drawing. The traditional teaching method uses blackboard and chalk; the teacher expresses meaning of drawings to the students by model demonstration and drawing in the backboard using chalk.

The instructional methods used in traditional classroom are done with manual tools such as chalkboard, drawing boards, large drawing instrument and still images. The drawing is made manually on the chalkboard with large drawing instrument where students are to wait until the teacher completes and displays the projected drawing. Students are expected to copy the drawing with or without the correct teacher's procedure.

The instruction method employed in the traditional classroom lacks cognitive strategies to ensure student's retention of facts, problem solving and adaptation. This implies that the traditional methods and the traditional tools limit extensive and variable practices, waste time, non-flexible and boring as students cannot work at their own speed [13].

From table 1, 43.05% respondents agreed that most technical teachers use several objects for illustration while teaching technical drawing. If the teachers were used the videocassette lesson, it makes the lesson become more attractive and efficient. "Visual" information clearly includes pictures, diagrams, charts, plots, animations, etc., and "auditory" information clearly includes spoken words and other sounds. The one medium of information transmission that is not clear is written prose [14].

From table 1, 86.12% of the respondent agrees that discussion and lecture methods of teaching are often adopted by most technical teachers during technical drawing lesson. Lecture method is a process of teaching whereby the teacher tells the students his planned facts. The students listen and take notes. The success of this method depends on the ability of the teacher to speak fluently in good tone and style.

The shortcomings of the lecture method are students may be passive since it is teacher - centered method, it does not encourage students enquiring or creative mind. Discussion Methods is an organized teaching/learning process. By this method, the class may be arranged in groups or panels. The class may remain together to exchange views, opinions or ideas on pre-determined topics. This is a method in which the students are actively involved if the groups are in small numbers and heterogeneous [15]. From table 1, 86.12% of the respondent agrees that students are sometimes given take home assignments in technical drawing; this will enhance their practical skill and performance.

No.	Item	N	Agree	%	Disagree	%
1.1	Most technical teachers use traditional methods of teaching during technical drawing class	72	53	72.36	19	26.38
1.2	Discussion and lecture methods of teaching are often adopted by most technical teachers during technical drawing class	72	62	86.12	10	13.88
1.3	Students are sometimes given take home assignments in technical drawing	72	65	90.27	7	9.72
1.4	Several objects are used by the technical teacher for illustration while teaching technical drawing	72	31	43.05	41	56.94

Research Question 2: How available and adequate are instructional facilities for the teaching of technical drawing?

Table 2: Percentage responses on the availability of adequate instructional facilities for the teaching of technical drawing

that the technical drawing teachers do not exercise well before

No.	Item	N	Agree	%	Disagree	%	No.	Item	N	Agree	%	Disagree	%
3.1	The students' interests are positive and usually very high when drawing materials and equipment are available and adequate	72	62	86.11	10	13.89	2.1	Adequate drawing materials such as drawing table, drawing class, and books are provided for technical drawing teaching and learning.	72	11	15.27	61	84.73
3.2	Peer groups and parents perceptions about technical drawing also affect the students' interests; most of them want their children to study easy subject to enable them pass their school examinations	72	59	81.95	13	18.05	2.2	Sometimes students do pair with other students on a drawing table during technical drawing lessons	72	60	83.33	12	16.67
3.3	Technical drawing teachers should cultivate the habit of improvising the non-available materials and equipment to raise the students; interests in learning technical drawing	72	60	83.33	12	16.67	2.3	Technical drawing teachers sometimes borrow drawing materials from draftsmen during technical drawing classes	72	56	77.78	16	22.22
3.4	Giving technical drawing assignments to enable them practice at home with their own drawing materials enhances students' interests in technical drawing.	72	66	91.67	6	8.33	2.4	Other instructional materials such as computer aided designs software, video tapes of drawings and internet facilities for students' are not adequately available.	72	55	76.38	17	23.62

their class and they focus simply on theoretical concepts only.

From table 2, 84.73% of the respondent disagreed with availability of adequate drawing materials such as drawing tables, drawing class, and books for technical drawing teaching and learning. This shows that there are no adequate technical drawing facilities and equipment's in most technical and vocational schools in East Gojjam, Ethiopia. To get good performance technical person, the school should have drawing class with drawing facilities like drawing tables, technical drawing reference books and drawing equipment's in adequate manner.

From table 2, 83.33 % of the respondent agreed that students do pair technical drawing exercises with others on a drawing table. The problem of do pair technical drawing within one drawing table is it affects the quality of the drawing due to shortage or limited areas for drawing.

From table 2, 77.78 % of the respondent agreed that technical drawing teachers sometimes borrow drawing materials from draftsmen during technical drawing classes. It indicates

From table 2, 76.38 % of the respondent agreed that the technical and vocational school lack some instructional materials such as computer aided designs software's, video tapes of drawings and internet facilities for students'. The researcher supervising that technical and vocational schools doesn't have latest computers and internet facilities for their technical education students. The computer aided design tool (CAD) hold promise for improving teaching and learning of technical drafting and design. It promotes and takes educational advantages of students' motivation by creating curiosity, interest, positive self-efficacy and adaptation to students varying differences. This implies that CAD is expected to be productive because of its seeming emphasis on students' motivation, interest, retention, critical thinking, interaction, high learning rate, active learning, problem solving abilities and general academic achievement [16].

Research Question 3: How positive are the interests of students in learning technical drawing?

Table 3: Percentage responses on the interests of the students in learning technical drawing

From table 3, 86.11% of the respondent agreed that the students' interests are positive and usually very high when drawing materials and equipment are available and adequate. From table 3, 81.95 % of the respondent agreed that peer groups and parents' perceptions about technical drawing also affect the students' interests; most of them want their children to study easy subject to enable then pass their school examinations.

Peer group plays an important role in the lives of students. They form a critical part of the social environment of school

From table 3, 83.33% of the respondent agreed that technical drawing teachers should cultivate the habit of improvising the non-available materials and equipment to raise the students; interests in learning technical drawing. From table 3, 91.67% of the respondent agreed that giving technical drawing assignments to enable them practice at home with their own drawing materials enhances students' interests in technical drawing.

No.	Item	N	Agree	%	Disagree	%
4.1	The use of standard drawing table makes students learn technical drawing better and easier	72	68	94.45	4	3.07
4.2	Standard drawing set-square, T-square, French curves etc. makes students learn technical drawing easier and faster	72	67	93.01	5	6.99
4.3	Standard drawing studios is a must for effective teaching of technical drawing in technical and vocational schools	72	54	75	18	25
4.4	White-bulb fluorescents lights, fans and air condition are needed in the drawing studio for the student's comforts	72	50	69.5	22	30.5

and also create and maintain a culture different from the home. It is obvious Peer groups are not a fad or a trend, they are around to stay; therefore, Parents, Teachers and Administrators should be on watch-out to identify the types of peer their students move with both in school and outside the home.

They should do their best to see that their children relates with friends who can positively influence them and have good impact on their academic performance [17]. Understanding the nature and the magnitude of peer group effects in education is crucial for the "productivity" of educational processes and the organizational design of school systems. For example, in order to improve student outcomes, it is important to know which inputs influence their performance most and the relative importance of peer effects compared to other inputs, such as teacher quality or school resources [18].

Research Question 4: What are the suitable instructional facilities for teaching technical drawing?

Table 4: Percentage response on the suitable instructional facilities for effective teaching of technical drawing

From table 4, 94.45% the response of the respondent agreed that the use of standard drawing table makes students learn technical drawing better and easier. When, all the drawing instruments are fulfilled, the students learn and done technical drawing with in short periods of time.

Also from table 4, 93.01% of the respondent agreed that standard drawing set-square, T-square, French curves etc. makes students learn technical drawing easier. The standard drawing instruments save time to draw complex drawings and so it was advantageous for students. From table 4, 75% of the respondent agreed that standard drawing studios are used for the efficient teaching and learning methodologies of technical drawing in technical and vocational schools. Also the respondents agreed that white-bulb fluorescents lights, fans and air condition are needed in the drawing studio for the student's comforts. When the working environment is safe, the

students make their work in safe condition and so like the subject.

6 DISCUSSION OF MAJOR FINDING

The data collected on the methodologies that adopted in effective teaching and learning technical drawing in technical and vocational school as presented in table 1 shows that discussion, lecture methodologies and some illustrations were adopted in teaching and learning technical drawing in technical and vocational schools in East Gojjam, Ethiopia. The drawing instruments are not easily access by students that it had its own negative effect on the interest of the students for the subject. The study identified various factors for the efficient teaching and learning methodologies of technical drawing like lack of drawing equipment's like set square, T-square and drawing board and lecture methods of the teacher.

7 CONCLUSION

Based on the result of the study, the following conclusions were made. The instructional methods adopted by technical teachers greatly affect the learning of technical drawing. This study examined the factors that affect the effective teaching and learning methodologies of technical drawing in Debre Markos technical and vocational schools. This study shall be of high benefit to students because they will benefit from the results of the study such that they will identify the effectiveness in teaching and learning technical drawing methodologies. Teachers will also benefit from the study; they will be able to use findings of the study to evaluate the students, monitor and improve their competence in teaching technical drawing. The findings will also help to adopt the appropriate method of teaching technical drawing, especially the school and industries at large.

8 RECOMMENDATIONS

Based on the findings of the study, the following recommendations were made;

- Technical teachers should be encourages to use standard drawing instruments for the diverse learning styles of student in technical drawing classroom.
- There should be a priority of massive training of technical teachers in technical and vocational schools in the methodologies of effective teaching of technical drawing.
- The technical and vocational schools should be fulfill all facilities like standard drawing instruments, drawing boards and make environments safe for technical drawing class.
- Students should be available in technical drawing

class with their standard drawing equipment's.

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