Bangladesh Technical and Vocational Education and Training

Skills, Quality, and Employability

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"একটাই লক্ষ্য
হতে হবে দক্ষ"

Bangladesh Technical and Vocational Education and Training

Skills, Quality, and Employability

edited by
Dr. Md. Omar Faruque

Directorate of Technical Education

Dr. Dipu Moni, M.P.
Minister
Ministry of Education
Government of the People's Republic of Bangladesh

MESSAGE

The Technical and Madrasah Education Division (TMED) has been emphasizing on improvising Technical and Vocational Education and training (TVET) delivery in Bangladesh. Under the visionary leadership of Honourable Prime Minister Sheikh Hasina, the present government is committed to improve the quality of technical education after attaining a remarkable rise in TVET enrolment. It is very important to ensure that our TVET graduates receive employable skills and knowledge to cope up with the rapidly changing job market.

It is a great news indeed that Directorate of Technical Education (DTE) under TMED has set up a Research and Knowledge Management Cell to encourage and facilitate the research initiatives of TVET teachers from field level as well as from policy level officials. This year, the Cell has compiled the 10 research works executed by respective teams and initiated to publish in a book. This publication should be able to enhance the image of our technical education system locally and internationally. It shows the capacity of our teachers and staffs to carry out research and analysis of concerned issues and how to address them.

I hope that the research works compiled in this book will effectively reflect the present TVET scenario of Bangladesh and provide fruitful recommendations to take it to the implementation level. I thank Secretary TMED and DG, DTE for coordinating the finalization of this publication. Congratulations to the research teams for all their hard work.

My heartiest good wishes are with this publication.

Joy Bangla, Joy Bangabandhu
May Bangladesh live forever

Dipu Moni

Dr. Dipu Moni, M.P.

Mohibul Hasan Chowdhury, M.P.
Deputy Minister
Ministry of Education
Government of the People's Republic of Bangladesh

MESSAGE

The economic transformation of Bangladesh heavily relies on educational transformation in line with modern demands. Education not only is responsible for social reformation but also enabling employable workforce with appropriate technical education, skill and training. Bangabandhu Sheikh Mujibur Rahman dreamt of economically resilient Bangladesh which will rely on developed and skilled human resources. It is only technical education that can truly transform our human resources by providing knowledge, skills and attitude befitting with modern technological field.

There are challenges in implementing technical education in full fledge as we intend to do. To identify the problems and make technical education relevant, extensive research and analysis is required. The initiative from Directorate of Technical Education (DTE) is really praiseworthy as they have been conducting research works for past few years through their teachers. Not only that, this year they have decided to publish 10 research works to widely circulate the issues, challenges and relevant findings of technical education.

I earnestly wish that the objective of this publication is fulfilled and it reaches other researchers and affiliating institutions to open new opportunities for exchanging views, technology transfer and research collaborations. I thank and congratulate everyone associated with the publication of this book including academicians, teachers, and officials.

I wish highest success of this publication.

Joy Bangla, Joy Bangabandhu
May Bangladesh live forever

Mohibul Hasan Chowdhury, M.P.

FOREWORD

Bangladesh has been enjoying demographic dividend for quite some years. It is projected that up to year 2040 we will be having more youth than any other times in history. The enormous potential of youth has every possible quality to transform into skilled workforce for both local and overseas job markets. TVET is considered as the key tool to enable them with employable life skills. It is high time to mainstream technical education to shift the paradigm of learning to technical hands-on-learning. For that, adequate research and exploration needs to be done in the applicable areas for enhancing the quality of TVET delivery and ensuring employability of the graduates.

I am happy to learn that Directorate of Technical Education (DTE) under the Technical and Madrasah Education Division (TMED) has conducted 10 research works through their teachers and officers. This shows their commitment to improve the areas of TVET in the country, which needs more attention. TVET teachers will logically have the best experiences about what issues needs addressing for betterment of TVET system. I appreciate deeply the initiative of the DTE to publish the research works conducted.

I thank wholeheartedly the resource persons, researchers, and professionals from various institutions who have selflessly provided their intellect to shape the research works into publishable format. DG, DTE has done a great coordination in finalizing this publication. I also congratulate the research teams upon their successful completion of research activities.

I hope that the recommendations derived from the research works would feed to the policy level decision-makings. Circulating the research papers will also encourage innovative ideas to come from the field level. I believe this publication will also reach beyond borders, and global TVET researchers will also get to know about the works of our teachers and researchers.

I sincerely wish every success of this publication.

Md. Kamal Hossain
Senior Secretary, Technical and Madrasah Education Division,
Ministry of Education, Government of People's Republic of Bangladesh

PREFACE

The present government has given highest importance to the popularization, expansion, and development of Technical and Vocational Education and Training (TVET) in Bangladesh. The Directorate of Technical Education (DTE), under the supervision of Technical and Madrasah Education (TMED), Ministry of Education is continuously striving for quality enhancement of TVET in Bangladesh. As the lead authority of TVET, TMED is entrusted with formulating policy-level decisions, identifying areas for expansion and quality improvement, and capacity building of this sector's existing individuals and institutions.

Research can play a vital role in the proper policy formulation, assessment, impact evaluation, skills mapping, analysis of labour market demand, and determining the market mechanisms for TVET. Realizing the importance of research, DTE established a Research and Knowledge Management Cell in 2018. To facilitating the research enthusiast TVET teachers, officials, and staff, and to explore new research for TVET management, development, and coordination, the Research and Knowledge Management Cell invited research proposals in 18 areas for the FY 2021-22. A total of 26 research proposals were submitted within the stipulated time in a wide range of TVET fields. These proposals were duly presented in the direct presence of the research team. Upon reviewing the submitted research proposals and presentations, 10 research groups were selected to complete the research in FY 2021-22.

With special supervision from Director General, DTE, the Research and Knowledge Management Cell facilitated 10 research projects this year in 2021-22. Renowned researchers Professor Dr. Syeda Tahmina Akhter from Institute of Education and Research, University of Dhaka; Professor Dr. Mohammad Lutfor Rahman from Institute of Statistical Research and Training, University of Dhaka, Dr. Mohammad Harunur Rashid Bhuyan, Research Fellow, Bangladesh Institute of Development Studies, and Dr. Raju Mohammad Shohidul Islam, Deputy Director

(Research), Bangladesh Technical Education Board has contributed directly as supervisors to articulate the research works. Professor Dr. S M Hafizur Rahman and Associate Professor Shah Shamim Ahmed from the Institute of Education and Research, University of Dhaka, has enriched the research with their valuable and constructive suggestions during the planning and development of research work. Professor Dr. Jakir Hossain from the Institute of Bangladesh Studies, University of Rajshahi, has consulted profoundly for fine-tuning these research works. Professor Dr. A S M Atiqur Rahman from the Institute of Social Welfare and Research, University of Dhaka provided valuable instruction for completing the research work. Engineer Md. Aktaruzzaman, Director (Planning and Development), has acted as the focal coordinator for conducting the research works.

The Research and Knowledge Management Cell is sincerely thankful to the resource persons, consultants, and supervisors for their instructions, guidelines, and consultations. The research teams have put in great efforts to successfully conduct the research works this year. This is for the first-time research articles are being published in a book format with the high hopes and possibilities that the findings and recommendations from these analyses will provide pathways for future policy initiatives and further quality research in the field of TVET in Bangladesh.

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ABBREVIATIONS

4IR	Fourth Industrial Revolution
AQF	Australian Qualification Framework
BANBEIS	Bangladesh Bureau of Educational Information and Statistics
BBS	Bangladesh Bureau of Statistics.
BMET	Bureau of Manpower Employment and Training
BNQF	Bangladesh National Qualifications Framework
BTEB	Bangladesh Technical Education Board
CBC	Competency based Curriculum
CBE	Competency based Education
CBLM	Competency based Learning Materials
CBT	Competency based Training
CBT&A	Competency based Training & Assessment
CPTU	Central Procurement Technical Unit
CPSC	Colombo Plan Staff College for Technician Education
CS	Competency Standards
DoF	Department of Fisheries
DTE	Directorate of Technical Education
ECs	Engineering Colleges
FAO	Food and Agriculture Organization
FC	Flipped Classroom
FDE	Female Diploma Engineer
FGD	Focus Group Discussion
FY	Financial Year
HEIs	Higher Education Institutions
HRM	Human Resource Management.
ICT	Information and Communication Technology
ILO	International Labor Organization

ISC	Industry Skills Council
ISCO	International Standard Classification of Occupation
KII	Key Informant Interview
KOICA	Korea International Corporation Agency
LM	Learning Method
MoU	Memorandum of Understanding
NGO	Non-Governmental Organization
NSC	National Skill Certificate
NSDA	National Skills Development authority
NSDC	National Skills Development Council
NSDP	National Skills Development Policy
NSQF	National Qualification Framework
NTVQF	National Technical and Vocational Qualification Framework
NTRCA	National Teacher Recruitment Certification Authority
OBE	Outcome Based Education
OSC	Occupation Specific Competency
PBL	Project-based Learning
PPR	Public Procurement Rules
RTO	Registered Training Organization
RPL	Recognition of Prior Learning
SCDC	Standard and Curriculum Development Committee
SDGs	Sustainable Development Goals
SPSS	Statistical Package for Social Science
SRT	Sex reversed tilapia
STR	Students Teachers Ratio
TAFE	Technical and Further Education
TMED	Technical and Madrasha Education Division
TESDA	Technical Education and Skills Development Authority
TSC	TSC Technical School and College

TTTC	Technical Teachers Training College
TVEC	Tertiary & Vocational Education Commission
TVET	Technical and Vocational Education and Training
VTTI	Vocational Teachers Training Institute
VQF	Vocational Qualification Framework
QAM	Quality Assurance Manual
QF	Qualification Framework
WBL	Work-based Learning
WoK	Web of Knowledge

CONTENTS

PART II: TVET QUALITY AND EMPLOYABILITY

BANGLADESH TVET SKILLS, QUALITY, AND EMPLOYABILITY

Dr. Md. Omar Faruque

In the present world, an important part of employment consists of occupations that focus on applying technical skills to the world of work. Technical and Vocational Education and Training (TVET) is referred to as "those aspects of the educational process involving, in addition to general education, the study of technologies and related sciences and the acquisition of practical skills, attitudes, understanding, and knowledge relating to occupations in various sectors of economic life" (UNESCO, 2015). TVET has been called the 'master key' to development in many parts of the world. This is because it gives a country both local and international skills and knowledge for using technology in the future workplace. It is concerned with acquiring knowledge and skills for the world of work to expand prospects for productive empowerment and socio-economic development. It improves access to the practical skills, information, and attitudes connected to occupations (i.e., competence) that support decent jobs and living sustainability. TVET equips people with technical and vocational skills and a broad range of knowledge, skills, and attitudes that are now recognized as indispensable for meaningful participation in work and life.

Technical and Vocational Education and Training (TVET) has been gaining popularity for economic transformation in the global context. The potential of TVET to drive and make society progress is widely accepted (ILO, 2018). Many countries have strengthened policy guidance and regulatory frameworks for technical and vocational education and training and improved partnerships with the private sector and employers (Pavlova, 2014). TVET is too gaining importance in global education discussions, government education priorities, and national development agendas (Marope et al., 2015), and accordingly, TVET is placed high on the country's strategic and operational goals. TVET systems must undergo persistent change and revitalization to realize their development-impacting potentials.

Irrespective of the country's context, TVET is considered one of the most effective tools to increase employability among its receivers by unlocking the productive potential of its working-age youth. The TVET sector plays a vital role in realizing Sustainable Development Goals (SDGs) since it equips youth (including drop-outs and disadvantaged groups) and adults with the required skills, knowledge, and attitudes for the industry. The sector helps increase household incomes, reduce poverty, improve living standards, and enable more access to a country's inclusive education and socio-economic development (Maw Tun and Juchelkova, 2022).

In Bangladesh, each year, more than two million people, the majority of whom are young, enter the labor force, but only half a million are trained. About 63% of the country's entire population is between the ages of 15 and 49, while 37% of the labor force is between the ages of 15 and 29 (LFS 2016–17). The Labour Force Survey 2016–17 indicates that millions of people of working age are still unemployed or working in the informal sector. Bangladesh's substantial structural change of economy

away from traditional agriculture and toward export-focused manufacturing and service sectors has also raised the demand for skilled labor, especially in export-focused manufacturing companies. Bangladesh's relatively young population—referred to as its "demographic dividend" allows for economic growth potential that can come from changes in the age structure of a population, especially when the share of the working-age population (15 to 64) is larger than the share of the non-working-age population (14 and younger and 65 and older). Before this demographic advantage vanishes in a decade or so, Bangladesh must capitalise on its youth population by training them. Training geared toward the labor market could transform these individuals into human capital and satisfy industrial demand.

Due to the immense unemployment and under-employment pressures on the domestic labor market, the government of Bangladesh has established a strategy of promoting overseas employment. Nevertheless, 52% and 14% of migrant employees are low- and semi-skilled, respectively. Bangladesh has a goal of achieving middle-income status by 2024. To achieve this, the nation must raise investment in socio-economic development, expand the manufacturing sector's proportion of GDP, increase and diversify exports, and produce skilled employees for both the domestic and international labor markets. For the skill development of people, the development of TVET gets priority in the government's policies, planning, and strategies.

Skills are a prerequisite to ensuring quality TVET graduates, who ultimately become an asset to the nation. In the national context, TVET will be able to provide qualified graduates who appropriately fit different occupation-based job sectors. There is a need to target high-demand jobs concerning the global job market. Private organizations have raised voices that they do not get skilled graduates who are as technically capable as they need. This

issue clearly points out the need for strengthening the industry-academia linkage. Therefore, quality assurance is an indispensable process for achieving the national goals in TVET, which will lead to the production of qualitative human capital for sustainable national development. Producing quality graduates with appropriate employable skills, including technical and soft skills, has to be the outcome of quality TVET. Only then could TVET be used as the master key to unlock the Bangladesh's development potential.

The integration of education, skills, and work is deemed a priority activity for human resource development through TVET. To deal with the problems happening now, Bangladesh has already made policies and strategies about TVET and taken important steps to improve the quality of TVET sectors. Few investment initiatives align with Bangladesh's national goals to promote skill development. ILO-TVET Reform Project supported by EC, Skill Development Project (SDP) by GoB, ADB, and SDC, Skill and Training Enhancement Project (STEP) supported by the World Bank, and Canada, Bangladesh Skill for Employment and Productivity (B-SEP) supported by Canada, Skills for Employment Investment Program (SEIP) supported by ADB, and Skill for Employment of Bangladesh (SEP-B) supported by DFID are noteworthy initiatives. The purposes of these projects are to establish a demand-driven, flexible, and responsive TVET system that provides skills training to meet the needs of the labor market and to strengthen selected public and private training institutions to improve training quality and the employment prospects of trainees with a focus on and encouragement of female participation in TVET. These initiatives promote the inclusive growth strategy of Bangladesh by creating more employment possibilities for the poor and disadvantaged.

The Directorate of Technical Education (DTE) under the Technical and Madrasah Education Division (TMED) is playing a key role in achieving the SDG targets for ensuring quality

education and skills development in TVET. DTE has achieved remarkable progress in enrollment, curriculum development, teachers training, and international cooperation for TVET development. In terms of TVET expansion, the target is to achieve TVET enrollment rates of 20% by 2020 and 30% by 2030, thereby transforming the demographic dividend into human capital. With the support of DTE, TMED has made a Master Action plan, known as the "Integrated TVET Action Plan," for the overall development of the TVET sector. TMED has started a number of projects and programs to improve the quality of technical education and make it uniform. One of the biggest achievements of the Technical and Madrasah Education Division is to finalize a ten-level Bangladesh National Qualification Framework (BNQF), which incorporates qualification levels from all streams of education and establishes a multilateral shifting mechanism between the streams for wider acceptance and recognition of TVET.

No doubt, Bangladesh needs to prioritize TVET as its mainstream education to reap the benefits of the demographic dividend. An integrated policy framework with TVET at its center and a rapid transformation from conventional to quality technical education are only a matter of time. The national and global policies for development support the TVET sector in prioritizing its goals and setting achievable indicators. The government of Bangladesh has rightly prioritised TVET at the policy level through formulating national policies and adopting numerous plans such as the National Education Policy of 2010, the National Skills Development Policy of 2011, the 8th Five Year Plan (2021-2025), the Sustainable Development Goals (SDGs) (2015-2030), the Perspective Plan (2021-2041), and the Delta Plan-2100, all of which have a focus on human resource development.

The government has also taken initiatives to incorporate technical and vocational education into every national planning

approach to transform people into human resources, and to meet the challenges of the Fourth Industrial Revolution (4IR). To transform Bangladesh into an upper-middle-income country by 2031 and a developed country by 2041, the present government has identified the expansion and improvement of technical and vocational education as a priority sector. To implement the task, the government has already acted to increase the student enrollment rate in technical and vocational education to 25% by 2025 and 30% by 2030. Regarding this, the establishment of new TVET institutes and the infrastructure development of existing institutes, as well as the student scholarship and stipend programs, are being carried out by the Directorate of Technical Education (DTE). At the same time, it conducts various programs, including organizing teachers training at home and abroad, setting up industry-institute linkages, formulating up-to-date curricula, and holding job fairs and skills competitions and so on. It is playing a leading role in transforming human resources into productive human capital.

There are eight investment projects and two technical assistance projects going on under the DTE. In addition to building the capacity of existing institutions, work is underway to set up new technical institutes and incorporate new trades and technologies to meet national and international demand through these projects, and 429 TSCs will be set up in phases across the country. Under the project "Establishment of 100 Technical Schools and Colleges (TSC) in 100 Upazilas," admission of students in Classes 6 to 9 has started in 70 newly established TSCs in the 2021 academic year. In addition to the existing four engineering colleges, work is underway to set up four more engineering colleges in four divisions. To increase the participation of female students in technical education, in addition to the existing four women's polytechnic institutes, DTE is taking the initiative to set

up four more polytechnic institutes for women in four divisional cities.

Additional to the ongoing activities, in 2022, DTE proposed four new projects from its revenue budget. Additionally, DTE initiated a project called "TVET Teachers for the Future (TTF)" with the support of the Asian Development Bank (ADB) and another project called "Promoting Gender Responsive Enterprise Development and TVET Systems (ProGRESS)" in collaboration with the Global Affairs Canada (GAC). Another technical assistance project is also proposed with the cooperation of the Japan International Cooperation Agency (JICA), namely "Project for the Improvement of Equipment for Technical Education." In all these projects, emphasis is given to students with special abilities and ethnic minorities, along with establishing new institutions and developing existing institutions.

True, despite the policy and program practices in the sector, TVET is too confronted with a variety of challenges that must be addressed delibarately and sustainably. In certain industries, widespread unemployment, under-employment, and a dearth of employment opportunities exist. Due to a deficiency in skills, Bangladesh's massive labor force is underutilized. The inadequate internal and external efficiency of TVET in offering a market-driven, relevant, and flexible program continue to impede the development of a skilled labour force.

One of the major obstacles to TVET is the social acceptance of the technical and vocational education. Typically, two-thirds of the labor force in a developing nation is engaged in occupations requiring a skill level associated with vocational education and training. Unfortunately, among students, parents, and community members' mindsets, technical and vocational education and training is viewed as the second choice after an academic stream of education. In reality, a university degree is seen as a step toward

moving up in society, even if it doesn't lead to a job or enhanced livelihoods.

It is essential to maintain the sustainability of TVET delivery, applicable curricula, and its systematic upkeep. This action requires adequate resources and effort to be implemented. The Bangladesh Technical Education Board along with other TVET institutions must be empowered with adequate human resources, logistics, and expertise.

In Bangladesh, women are underrepresented in nearly every facet of technology integration. One of the major societal variables impacting the usage of ICT is the low social standing of women; as a result, providing women with education or valuing their use of technology are not regarded as essential. Many female students at TVET institutions may not receive proper support for integrating technology into their teaching and learning environments. Thus, attracting more female instructors, administrators, and students into TVET is a major challenge in the future.

Teachers' lack of knowledge and skills is one of the most important obstacles in the TVET teaching and learning process. Integrating technology into TVET systems necessitates knowledge of the subject matter, an awareness of how students acquire this knowledge, and a level of technical proficiency with various technologies. The process requires an appropriate connection between technology, content, and meaningful instruction. However, teachers who lack enough knowledge and abilities about technology integration will encounter difficulties, resulting in negative attitudes toward using technology in the classroom. The use of technology in teaching and learning situations at TVET institutions in Bangladesh has been limited due to a lack of understanding regarding the use of technology and a lack of expertise on technology-based tools and software.

The employability of TVET students is another important challenge. It was frequently stated that the TVET system must better meet the needs of the industry by ensuring that the supply of skills matches the demand for skills. Identifying meaningfully the supply and demand for skills and competencies presents substantial conceptual and definitional obstacles. In Bangladesh, not enough is known about the occupational and qualification structure of employment to justify allocating resources to specialized TVET training. A study on the employability of polytechnic students finds one-third of the graduates looking for employment remain unemployed (Nakata, Rahman, &Rahman, 2018). The picture is more glaring for female graduates, with less presence in employment as well as in further education.

All these challenges of skills, quality, and employability have considerable implications for TVET. With the revolution in production technology, high-speed Internet, and Artificial Intelligence, there is a shift towards occupations requiring high skills and technology. It is estimated that 75% of future jobs will require science, technology, engineering, and mathematics (STEM) skills and knowledge. The present education and training system is yet to satisfy such higher-order cognitive requirements of the future world of work.

Research and development bring new ways of thinking to increase the quality and employability of the TVET system. TVET research is necessary for socio-economic development because every single research finding can positively impact the quality of TVET programs. TVET, by its nature, is always changing and has to adapt to modern technological innovations. It is also important for TVET personnel, including practitioners, teachers, managers, and students, to explore areas for improvement where further knowledge exploration is required. From this point of urge, research and knowledge practice are ample needs for TVET. This

has a two-way benefit, as the teachers will be able to nurture their research and analytical abilities, and of course the TVET system as a whole will benefit from the recommendations and findings as well. Also, we require emphasizing quality improvement, robust monitoring, and evaluation for TVET and having national development plans aligned with TVET policies. The enhanced knowledge base requires focusing more on the skills, quality, and employability beyond the traditional focus on the enrolment increases and efficient implementation modalities for TVET.

The chapters in this book cater to the need for knowledge generation on skills, quality and employability. The subsequent chapters of this book are split into two parts, focusing on the important skills, quality, and job-readiness aspects of TVET.

Skills and Quality

The first part of the book comprises five chapters on the skills and quality of TVET. These include TVET quality, competency standards, flipped classroom and online teaching, and subject-based teachers' training.

This part—skills and quality—opens up with TVET—opportunities, challenges, and policy options for enhancing quality technical and vocational education and training. Syed Abdul Aziz, and Md. Rezaul Hoque, in their paper, "Quality Technical and Vocational Education and Training: Opportunities, Challenges, and Policy Options," address four interrelated dimensions of Technical Vocational Education and Training system: quality, opportunities, challenges, and policy options for improving TVET quality in Bangladesh. The paper identifies quality indicators used to measure the quality of TVET in Bangladesh and unveils the opportunities and challenges in the context of Bangladesh's employment market. The study finds that not Optimum Student-Teacher Ratio (STR), shortage of teachers, lake of updated

teaching quality, long teacher selection criteria, a lengthy teacher recruitment process, and a declining graduate employment rate in emerging technologies are the challenges that the TVET system in Bangladesh is faced with. The identified intervention areas to improve the quality include, among others, a reasonable student-teacher ratio, unified qualification of teachers, and reform of the teacher recruitment process.

The next chapter is focused on the competency standards of the Bangladesh National Technical and Vocational Qualifications. Md. Shah Alam Majumder, Md. Mahabub Alam, and Humyra Maisur examine how and to what extent competency standard-related factors like quality, duration, and level in the qualification framework and assessment strategies affect the enrollment, expansion, and implementation of the NTVQF in Bangladesh. The findings comprehended that the competency, underpinning knowledge and skills, required attitude, resource implications, methods of assessment, and context of assessment are quite good and acceptable. However, numerous proxy factors critically affect the implementation of the NTVQF. These affecting factors are creating unwillingness towards training under the qualification framework, reducing trainee enrollment, losing interest, and, in some cases, making it impossible to receive training and further training at higher levels, ultimately creating an obstacle to the expansion of training and education under the qualification framework.

Good-quality subject-based skill training is needed to create good skill teachers. The skill-based qualifications of teachers and students in technical education are of a fairly high standard. Yet, technical education in Bangladesh is not reaching a standard place, especially in the Diploma in engineering courses from which Bangladeshi mid-level engineers are produced. The third chapter in this section focuses on Subject-Based Teacher's

Training for Government Polytechnic Institutes. Md. Rakibul Hasan and Md. Abdur Rahman explore the present status and challenges, as well as strategies to enhance subject-based skill training for government polytechnic teachers. The study found a shortage of training institutions compared to working teachers and no significant difference between trainees' and trainers' qualifications. Teachers have expressed satisfaction with the training for NTVQF certification from normal subject-based training. The main challenges of subject-based teacher training are the unavailability of training institutes, the lack of infrastructure and qualified trainers in technology-based training, the limited scope of technology-based subjective training, and the lack of industry-institute linkage. Strategies to enhance subject-based teacher training include ensuring sufficient infrastructural facilities, such as ICT-based classrooms, hostels, and lab facilities with modern equipment; organizing Problem-Based Learning (PBL), Work-Based Learning (WBL), and Project-Based Learning (PBL) training; and establishing and strengthening industry-institute linkages.

The fourth chapter is focused on the feasibility of a flipped classroom approach in Electrical and Electronic Engineering Courses. Face-to-face class delivery blended with self-paced interactive learning via online technology has been a well-known and effective teaching and learning practice in many parts of the world. However, due to a lack of infrastructure, students from underdeveloped and developing countries are underprivileged from such an effective teaching and learning strategy. Recent need for delivering online education due to prolonged mobility restrictions during the COVID-19 pandemic made it inevitable to integrate blended learning pedagogy into learning and teaching. Furthermore, as a part of 'The Bangladesh government's vision to establish the country as "Digital Bangladesh" by 2030, it is

imperative to catch up with global digital technological trends in every sector, including the education system. Md. Shahid Iqbal, Abdur Rouf, and Salman Fazle Rabby analyse the feasibility of one of the Blended-Learning strategies, e.g., Flipped Classroom learning approach for undergraduate engineering courses in Engineering Colleges in Bangladesh. Despite the concept being new to Engineering Colleges, the authors claim that there are ample opportunities to implement the Flipped Classroom technique that would remarkably enhance teaching and learning effectiveness in these institutes. Hesitancy towards adapting new methods and technology in teaching and learning contexts is quite common in the cultural context of Bangladesh, and it can be readily overcome with appropriate training, a campaign, and progressive implementation of the Flipped Classroom Approach.

In a similar tone, the last chapter of this part is focused on online teaching-learning practices. Taking Graphic Arts Institute: as a case in point, Mst. Ayesha Siddika and Md. Ali Hossain explore the current situation of the new teaching-learning practice at the Graphic Arts Institute and find challenges it has or might face in the learning process. For ensuring effective online teaching and learning practices at Graphic Arts Institute, the study suggests that students need logistics and digital equipment, extra-curricular activities, monitoring, and appropriate training to develop communication among students, teachers, and parents.

Quality and Employability

The second part of the book focuses on the quality and employability of TVET in Bangladesh. The five chapters subsequently explore skills development and the effectiveness of industrial attachment, challenges in producing competent graduates, employment status and challenges for female diploma engineers, financial opportunities and challenges for diploma

graduates to become entrepreneurs, and aquaculture skills acquisition through TVET and practices in fish production self-employment.

This part starts with the effectiveness of the industrial attachment of polytechnic graduates in the Barishal District. Industrial training connects what students learn in the classroom with what they will encounter in the actual world of work. They also allow students to gain experimental experience and prepare them to compete in the competitive job market. Gazi Saiful Islam, Md. Selim Khalifa, and Sarmin Sultana examine the effects of industrial training programs not only on the professional development and abilities of TVET students in Bangladesh but also on their personal growth and development of skills.

The next chapter looks into the challenges in producing competent graduates in the government polytechnic institutes of Sylhet Division. Graduates of these polytechnic institutions are large in number and work inside the country and abroad, but they are yet to be competent in job placement. Mohammed Atiqul Hasan and Md. Titumir Hasan look into the problems of the students after having gained practical and institutional skills from three government polytechnic institutions in the Sylhet Division of Bangladesh. According to the authors, the curriculum is well-furnished but not yet capable of meeting industry demand. It needs to be updated rapidly with the advancement of modern technology. Institutional challenges in this study are a shortage of infrastructure, laboratory instruments, and inadequate skilled human resources to operate the machines.

The third chapter focuses on the employment status and challenges of female diploma engineers who graduated from polytechnic institutes in Barishal City. The authors—Pabitra Kumar Halder, S. M. Anisur Rahman, and Sanjoy Dhali—explored

job placement status, challenges, and barriers for female diploma engineers. The findings show that female engineers have not yet reached their desired targets, particularly regarding employment rate, technology and degree relevancy, and job satisfaction level as well.

The fourth chapter of this part looks in-depth at the financial opportunities and challenges facing diploma graduates who want to become entrepreneurs. Jihad Hasan Bhuyian, Md. Enamul Haque Rakib, and Emran Munsi highlight the scopes of financial assistance that an entrepreneur can avail from the government, banks, and NGOs. Most of them needed loans from financial institutions at the start-up stage, and the amount of the targeted loan was small. The study finds that the entrepreneurs neither get financial assistance due to a lack of experience nor get priority in the financial institutions as diploma engineers. Authors highlighted that innovative, energetic, and confident diploma graduates should be provided with opportunities of availing credit on a priority basis.

The last chapter of this book is on the acquisition of aquaculture skills through TVET and practices in fish production self-employment. Fish culture and breeding are among the major trades deployed to educate both male and female students, both in-house and in practice. Dr. Md. Anisur Rahman Mridha and Md. Nasirul Islam designed their chapter to quantify the aquaculture-based knowledge and practical skills of male and female students participating in TVET compared to the normal practices for aquaculture activities. The study finds that the female students showed better performances in the aquaculture practices than the male students and the neighbouring fish farmers. The authors vividly argue in their chapter that management practices with better knowledge and dedication increase gross economic returns in female treatment of aquaculture skills.

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PART I

TVET SKILLS AND QUALITY

1

QUALITY TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING: OPPORTUNITIES, CHALLENGES AND POLICY OPTIONS

Syed Abdul Aziz
Md. Rezaul Hoque

INTRODUCTION

A quality Technical and Vocational Education and Training (TVET) system can adopt technological changes, meet the changing needs of the employment market. Bangladesh has placed the utmost priority on quality TVET in order to increase youth employability, job market responsiveness, and the effectiveness of training quality in ensuring intended skills and competencies. The government of Bangladesh has taken specific strategies in the 8th Five-year plan (2021-2025) to strengthen TVET as a tool for achieving sustainable development goals and other consecutive perspective plans of Bangladesh (GoB, 2018).

TVET is considered as the tool for producing skilled and classified workforce. An opportunity in the Bangladesh TVET system is that the government has given more emphasis on TVET and declared it as the country's priority sector for skill development. GoB has set a target of increasing student enrollment of 30% by 2030 and 50% by 2041, from the existing 14% in 2016 (BTEB, 2016) correlating with quality.

TVET system in Bangladesh is witnessing an opportunity as the Ministry of Education has already approved the Bangladesh National Qualification Framework (BNQF) to classify all occupations in line with the educational level of achievement. If the BNQF can be properly implemented to ensure quality education, Bangladesh will be capable in producing skilled and classified workforce as per the defined levels of classified workforce demand in national and global job market (Ministry of Education, GOB, 2022; Rafique, 2022).

Bangladesh TVET system is faced with challenges in three dimensions of the governance instruments, operationalization, and delivery of products and services. The low productivity of the workforce and the inadequacy of the education and training system to meet the needs of the labour market is a challenge (Rafique, 2017). The specific challenges are high student-teacher ratio (STR), shortages of teachers, lengthy recruitment process, unavailable infrastructural facilities, low graduate employment rate, teaching-learning relying on theoretical classes, inadequate labour market connectivity and research, and industry-institute collaboration for offering the flexible programme as per the market demand.

Policy Option for TVET portrays a wide range of national responsibilities. The existing policy documents available in Bangladesh TVET system are National Educational Policy (NEP) -2010, National Skills Development Policy-2011, and Bangladesh Technical Education Board (BTEB) Act-2018. Other

major planning documents are Education Sector Strategy and Action for Implementation (FY 2016-2020), now shifted to the 8th Five-year plan (2021-2025), SDG (2016-2030), TMED's integrated development Action Plan (2020-2030), Bangladesh Perspective Plan (2021-2041) along with development plan and projects including World bank supported ASSET project, ADB supported Technical Teachers for the future project, and EU funded Human Capital Development Program 21 (HCDP 21).

TVET system is an integral part of the total education system of Bangladesh, and its legal framework is constituted by different constitutional acts, policies, and other legislative documents. National Education Policy 2010 introduced quality standards including standard student-teacher ratio (STR), and teachers' qualifications. In the BTEB act 2018, quality assurances are the mandatory function of BTEB. In the National Skills Development Policy-2011 quality assurance system was introduced for TVET.

In this background, this chapter seeks to (a) identify the required quality indicators to assess the effectiveness of the TVET system; (b) unveil the opportunities and challenges that are prevailing in Bangladesh TVET system; and (c) formulate the policy reform agenda to face the challenges and best utilization of the opportunity to improve the quality of TVET in Bangladesh.

The study follows a qualitative research approach. Existing policy and legislative documents are analyzed for the purpose of identifying the quality indicators, opportunities, and challenges.

The study is presented in three sections. The following section focuses on the significance of quality TVET and its conceptualization along with development of quality indicators of TVET. The third section identifies the challenges and opportunities of TVET system in Bangladesh. The final section draws conclusion and articulates recommendations.

TVET: SIGNIFICANCE OF QUALITY AND ASSESSMENT FRAMEWORK

Quality of training-learning depends on student enrollment; specifically, there is a direct impact of rapidly increasing enrollment on the number of teachers in the system. There are two interrelated phenomena for TVET teachers; the quantity of teachers as per the increasing trend of students' enrollment and recruitment process and criteria of teachers' selection, training, and quality improvement of teachers is also a concern for quality TVET.

The Bangladesh Constitution article 17.b describes clearly the fundamental purpose of state policy of education that the state shall adopt effective measures for "Relating education to the needs of the society and producing properly-trained and motivated citizens to serve those needs,"

National Education Policy (NEP)-2010 mentioned a standard student-teacher ratio as 12:1 (Chapter 5.7), emphasized the formation of a separate teachers' recruitment commission (Chapter 27), and provided a guideline for the quality teachers' selection (Chapter 28) and promoted technical and vocational education and training (TVET) as a whole. The NEP-2010 emphasizes constitutional guarantee of education at all levels, fostering creative thinking, evolving creativity and productivity, ensuring skills for competing global level, ensuring the importance of ICT at all levels, inculcating skills at all levels, ensuring the quality of education, and building skilled human resources.

National Skills Development Policy 2011 is a comprehensive policy for guiding the skill development strategies, facilitating improved coordination of all parties involved in education and training, providing vision and direction for skills development, setting out the crucial commitments and essential reforms, and implementing in partnership with industry, workers, and civil society.

As regards recruitment, Bangladesh Civil Service (Age qualification for direct recruitment) regulation, 2014 (Ministry

of Public Administration, GoB, 2014) mentioned the post of BCS technical education cadre and its criteria for direct recruitment. TMED, MOE introduced a recruitment regulation titled the Directorate of Technical Education and Institutes under the DTE and its non-cadre teacher and staff recruitment regulation-2020 (MOE, 2020). The DTE institutions created 12607 posts under this regulation. Its selection criteria developed and categorized recruitment into four types; direct recruitment, promotion, posting, and deputation or transfer set the benchmark for direct recruitment. Non-Government Teachers Registration and Certification Authority (NTRCA, 2021) has introduced certifying candidates for being teachers of non-government educational institutes and set criteria for the teaching posts by conducting a written test yearly. The certified candidates are eligible candidates for private TVET institutions.

Bangladesh Technical Education Board (BTEB) has introduced its recruitment regulations titled Recruitment Regulations for the Private TVET Institutes' Teachers Recruitment-1996. In this regulation, all government and non-government institutes' posts mentioned with their selection criteria has set comprehensively. It has also placed selection criteria of private polytechnic and vocational institutes (MPO supported) teachers. Some NGOs like UCEP have their selection criteria for trainers/instructors with minimum qualification criteria set by BTEB. The Bangladesh Technical Education Act-2018 mentioned its organization's mandate to introduce recruitment regulations for all its accredited institutes and their teachers (BTEB, 2018).

The Directorate of Technical Education (DTE) has conducted a tracer study with the support of the European Union and found a poor employment outcome for TVET in Bangladesh (DTE, TVET Graduate Tracer Study, 2021). The report suggested further improving the quality of TVET by emphasizing practical training on

modern equipment, communication skills, syllabus and curriculum improvement, relevant career guidance services, and teachers' quality improvement. The report also addresses DTE and BTEB to set a reasonable student-teacher ratio (Tracer Study Report 2020, DTE, November 2021). Another Tracer study was conducted by the DTE, BTEB, and IDEB jointly in 1997. The tracer study was conducted to trace the graduates of 17 polytechnic institutes in the process of getting employment and their performance in the job market and identify the problem of both graduates and employers for further improvement of the quality of the technical education system.

The Apprenticeship act is part of the Bangladesh Labour Act -2006. Chapter 18 of the act indicates the application and definition related to an apprenticeship. Another regulation on apprenticeship has been incorporated in Bangladesh Labour Rules 2015 in which apprenticeships were addressed for industry employment but needed its proper implementation in promoting employment for TVET graduates.

The Technical and Madrasha Education Division (TMED) prepared an 'Integrated TVET Development Action Plan' in 2018 to achieve Vision-2021 and SDG -2030 (TMED, Ministry of Education, Bangladesh). In chapter one, titled Policy and Project formulation and there are 50 (fifty) aspects are selected to execute in the short term (within 2020) mid-term (within 2025), and long-term (within 2030). In the policy and project formulation, a separate teachers' recruitment commission was proposed to ensure unified recruitment of all teachers. Other quality indicators were addressed, like TVET teachers' recruitment criteria are mentioned comprising industrial experience, teaching experiences, and training. Through proper implementation of this action plan, new opportunities like teacher

recruitment, training, capacity development, and networking with industries will be changed significantly (MOE, 2016).

The Bangladesh National Qualification Framework (BNQF) weaves general education, technical-vocational education, and higher education into a harmonized, quality-assured system. It defines pathways and equivalencies, which provide access to qualifications and assist people in moving easily and readily between the different education sectors and between these sectors and the labour market (BNQF, TMED, MOE, 2022).

Table- 1.1: List of Indicators for Quality Measurement of TVET

Aspects	Indicator (s)	Selected Indicator (s)
Demography	1. Least dependency ratio	
Access	2. Net enrollment ratio	
Internal efficiency	3. Coefficient of efficiency and Employment rate	Employment status
Quality	4. Student-Teacher Ratio	Student Teacher Ratio
	5. Percentage of Trained Teachers	% of trained teachers (Availability)
Management	6. Teachers Selection Entry criteria 7. Recruitment Process 8. Promotion Procedure	Teachers Selection Criteria Teachers Recruitment Process
Financing	9. Share of GDP to education & TVET 10. Private financing of education unaccounted to GDP	

Data Source: UNESCO Institute of Statistics 2009,

According to OECD, "A quantitative or qualitative factor or variable that provides a simple and reliable means to measure

achievement, to reflect changes connected to an intervention, or to assess the performance of a development actor." UNESCO Institute of Statistics (UIS) has defined a list of 10 indicators covering six aspects to measure the quality of TVET (Table 1.1). Five indicators were selected to measure the performance of Bangladesh TVET System. These are; student teacher ratio (STR), Teachers availability (% of trained teachers), Selection criteria, Recruitment process of teachers and TVET graduate employment rate.

OPPORTUNITIES AND CHALLENGES IN TVET SYSTEM

The opportunities and challenges of the Bangladesh TVET system are identified in two different contexts; Macro Context depending upon the natural, political, environmental, and government decisions, and Micro Context that depends upon the decision taken by the TVET administrator to implementing agencies like TMED, DTE, and BTEB.

Student Teacher ratio (STR): Student-Teacher Ratio (STR) is one of the major quality indicators that focuses on the quality situation of any teaching-learning process. In National Education Policy 2010, STR for TVET is set as 12:1. As per the BANBEIS report, STR for 52 polytechnic institutes was found to be 50:1 in 2018, and for TSC, STR was found at 36:1. In this study, data were collected from 93 TVET teachers of public and private polytechnic institutes, technical schools and colleges and private vocational institutes. Among the respondents,

- 34% of respondents (26 no of teachers) have STR 31-40;
- 21 % of respondents (25 no of teachers) have STR with 41-50;
- 27% of respondents (23 no of teachers) have STR with 50+
- Broadly 82% of teachers maintain class sizes from 31 to 50+.
- 18% of the respondents have STR below 30 (mostly from private TVET institutes).

During the investigation, one polytechnic institute were studied to explore the situation of STR specifically and found that they have a total 5120 student and the total number of teachers, including contractual (master role) teachers, was 63. So calculated STR of the institute was found to be 5120/63= 81:1.

Based on interview results with the respective principals, the causes for high STR are presented below:

- Increases seat capacity of Polytechnic and TSCs without ensuring additional teachers;
- Introduction of the additional group in the department without post creation & recruitment of teacher;
- Combining student groups in class routine in Polytechnic and TSCs;
- Introduced emerging (new) department(s) without recruitment of teachers;
- Startup new institutes (TSCs) without recruitment of teachers;
- Huge vacancy of teachers against teaching post.

Availability of Teachers: As per review from primary data, there are basically five types (status) of teachers are working under DTE institutes in diploma, SSC, and HSC Vocational Programme. These are:

1. BCS Technical Education Cadre (working at govt. polytechnic, TTTC & VTTI),
2. Non-cadre teachers (working at public Polytechnic Institutes and TSCs),
3. MPO supported Regular teachers (working at private vocational institutes),
4. Contractual teachers (working at Private/NGO-operated polytechnic institutes) and
5. Temporary/Part-Time Teachers (working in govt. polytechnic and TSCs).

DTE annual report 2020-21 analysis shows that there are 154 TVET institutes, including 1 TTTC, 1 VTTTI, 4 Engineering colleges, 50 polytechnic/ mono technic institutes, and 99 (64 old and 35 from 100 TSC project) technical schools and colleges running by DTE. In 2022 additional 35 TSCs under 100 TSC projects and one survey institute started academic activities, making the total TVET institutes 190 under the Directorate of Technical Education (DTE).

From the official information from the organograms cell of DTE, it is found that the total approved post of these 190 institutes is 15318, in which only 2709 number of teachers (18%) are working, and 12609 no of posts (82%) are vacant. Two teachers training institutes are running with 12 teachers out of 58 allocated posts (21%), polytechnic institutes are running with 1380 teachers out of 7433 allocated posts (19%), and TSCs are running with 1256 teachers out of 7678 allocated post (16%). Teachers' deployment in the newly started 70 TSCs is only 4.2% out of the allocated post (See Table 1.2).

Table 1.2: TVET Institute and Teachers Situation

Institute Category	No. of Institute	Approved	Filled	Vacant
TTTC	1	31[a]	11	20
VTTTI	1	27[b]	1	26
Engineering College	4	149	61	88
Polytechnic/Monotechnic	50	7433[c]	1380	6053
Technical School & College	134	7678[d]	1256	6422
Total	190	15318	2709	12609

Data Source: Review of DTE report 2017-18 and 2020-21, and survey data from DTE

Notes:

[a] Approved teaching post is 64; regular post is 31 and Trainees (TT Ins) post is 33.

[b] Total approved post of VTTI is 35; 8 posts for workshop super out of retention.

[c] Total approved post is 7433; 4300 post is 9th grade and above grade (Cadre-1644, non-cadre-2656) and remaining 3133 post is 10th and 11th grade.

[d] Total approved post of 134 TSCs is 7678; among those *4054* is 9th and above grade, remaining 3624 post is 10th and 11th grade

To achieve the national target of TVET enrollment by 20% by 2020 BTEB calculated the size of students' enrollment as 2000159. Based on this analysis and considering the existing national standard of STR 12:1, total teachers will be required against 2000159 students is 166680. The existing teachers' number is 50931 as per the BANBEIS report 2018. It Means 166680-50931=115749 new teachers will be required.

This is the national projection of TVET teacher's demand as per the standard STR 12:1. If we want to consider a nominal standard of STR 20:1 for an interim period and gradually meet the standard 12:1 by 2030 then the net required may calculate as 2000159/20=100008 teachers and existing teachers' number is 50931, so new teachers may calculate as 100008-50931=49077.

The GOB has set the next national target of TVET enrollment at 30% by 2030. To achieve the 30% TVET enrollment, students' enrollment size will be 8.1 million (As per the age group 15-24). Based on this calculation and considering the STR 12:1, calculated TVET teachers' sizes will be-8.1m/12=0.675 million. It finds that an additional 675000-100008=574992 number of teachers will be required.

Selection Criteria of TVET teacher in Bangladesh: The National Teachers Recruitment Certification Authority (NTRCA) conducts a nationwide written examination based on education qualification and certifies the eligible candidates for recruitment. The respective TVET institutes call for recruitment through national newspapers and conduct written or viva tests through BTEB approved selection committee. The private polytechnic institutes followed the BTEB-approved qualification criteria title "Service Regulation for Private TVET Institute Teachers and Staff." They describe the job responsibility of each teaching/trainer post. Their selection criteria combine educational qualification, teaching experience, industry experience, and other professional skills certification.

Table 1.3: Selection Criteria Differences of TVET Teachers at Entry Post

Teachers Type	Post	Education Qualification	Teaching Experience	Teaching Competency	Industry Experience	Industry Training
ASIAN TVET Teachers (Qualification Standard)	TVET Teacher	Bachelor Degree	At least 1 Year	Higher skill level	Work exp in industry	Occupational Competence
OECD Countries (Australia, Germany, Japan, UK &USA	TVET Teacher	Minimum Bachelor Degree	4-5	Certified	Compulsory	Compulsory
India (Tamil Nadu)	Polytech/ College Teacher	Minimum Bachelor Degree with language certification, first shortlisting basis on common and selected subject based online exam, Verified result and finalize list				
Bangladesh (TVET teacher for Diploma and SSC/HSC Vocational	TVET Teacher	Diploma in Engg for junior Instr.	X	X	x	x
Polytechnic and TSC (Public)	Junior Instructor	Dip in Engg First Division/GPA 3.00	X	X	x	x
Teachers of Private Polytechnic	Junior Instructor	Dip in Engg 1st Div or GPA 3.00	X	X	x	x
Teachers of MPO granted Private TVET	Trade Instructor	Dip in Engg 2nd Division CGPA	X	X	x	x
NGO-operated TVET Ins	Training Instruct	B. Sc/M. Sc in Tech	5 yr	√	√	√

Temporary teachers mean project-based teachers recruited centrally or locally, and part-time teachers are mostly recruited by the respective public TVET institutes (Polytechnic and TSCs). For project-based temporary teachers, the selection criteria and recruitment process are the same as the regular teachers, but for the part-time teachers, the selection criteria are not strictly maintained.

In summary we find that , educational qualification is the only criterion for selecting public private polytechnic teachers', but govt. and private vocational teachers' qualification has a difference in Grade Point Average (GPA) no for application. NGO (UCEP) recruited teachers' criteria included higher educational qualifications than public TVET teachers with at least 5 years of teaching experience, teaching (pedagogy) certification, industry experience, and training. The difference in selection criteria is elaborated in the Table 1.3

Employment Status of TVET Graduate: The employment rate is one of the main quality indicators of the TVET system. To identify the employment scenario of the Bangladesh TVET system, this study has considered two tracer study report, one is conducted in 1997 jointly by the DTE, BTEB and IDB in 1997 and the second one is conducted by the DTE in support of HCDP 21 project through EU technical assistance in 2021. Their main findings are as follows:

- Among the sample graduates, 85% find their employment within 18 months after graduation, including 15% self-employment.
- In the first entry job, 38% get Government and 62% got private jobs. Among the sample graduates in private jobs, 23% receive more pay than government jobs, 17% similar, and 60% get less pay.
- 55% of the graduates indicated that they entered into the Diploma course to study higher engineering courses.

- Graduates rated the availability of facilities as 40% of their requirements and utilization of facilities as are second lowest at 62%.
- The employment pattern of the surveyed industries was 1:1.65:14 among professional, mid-level technical manpower, and craftsman.
- The ability of diploma engineers was rated as the lowest among nine criteria and suggested that a proportion of curricula among technical and general subjects should be 70:30.
- The retention rate of students was 82% in 1996, which is 5% lower than 1995; the average throughput rate from 16 polytechnics for 10 years was 30%. The average pass of irregular and throughput together of 10 years was 49%.
- Graduates rated lack of capital/finance as the highest barrier to creating self-employment.

CONCLUSION

Quality TVET should be considered as the key for producing skilled TVET graduates as per the job market demand. Bangladesh TVET should successfully reform the TVET governance as per the policy guideline through developing the required act and regulatory framework. It may harness its immense human potential to face challenges and can boost employment in the country. Based on the findings and result, the following policy options with intervention areas have been formulated as recommendation of the study.

Reset STR: In National Education Policy (NEP)-2010, STR is set for TVET is 12:1. Considering the present teacher's shortages and existing classroom size, nominal/interim STR may formulate as for Polytechnic: Theory Class-40:1 and Practical Class-20:1 For TSC: Theory Class-30:1 and Practical Class-15:1.

Reducing Shortage of Teachers: In view of the fact that out of a total of 17581 existing teaching posts 18% are filled up, and 82% posts are vacant, there is a need to:

- Reorganize and implement new organogram of DTE (As per the action plan chap 1.10) Automatic vacancy post needs to be displayed, and online application and scrutinization provision will need to be introduced with proper regulatory provision
- Establish the Teachers Recruitment Commission (TRC) as per TMED AP Chapter 1.7. To avoid discrimination among the teachers after the establishment of TRC, there is a need to declare ineffective/N&V of the BCS RR-1981, BCS Technical Education Cadre-1992, and BCS Non-Cadre Recruitment Rule-2011.
- There is a need to issue a regulatory order to stop any new TVET institute without teacher recruitment (As per SRO no 182 of BTEB-1996)
- There is a need to set a universal selection criterion for all public and private TVET teachers through the development and implementation of the Teachers Qualification Framework (TQF) by the BTEB. Further needs to amendment/dissolve/ ineffective N&V order for "Recruitment regulation-2020 for Cadre and Non-Cadre officer and staff under DTE", and "SRO-54, 1996 of BTEB, Service Regulation for Private TVET Institute Teachers and Staff."

Continuous Professional Development of TVET teachers:

Need to define JD, JS, and PS as per the teaching post and responsibilities of each post as per the approved organogram of TVET institutions and organizations. There is also a need to design the CPD with a rightly experienced person in the BD TVET system and align with the approved QMS of TVET

Enhancing Graduate Employment Rate

There is a need to introduce the Workforce Employment Act specifying the responsibility and accountability of the employers, including upskilling the employed workforce and upcoming workforce replacement. There is a need to an amendment of apprenticeship act specifying the role of the education providers, employers, and trainees. There is a need to promulgate for operationalization of BNQF with the level of national skills standard classification of the workforce.

Upgradation of TVET curricula and Quality-Based Assessment

According to the recommendations of the previous national review committee, TVET courses must be revised every five years to reflect changes in the job market and to adopt 21st-century competences. There is a need to assess the TVET performance as per the standards of the norm with respective indicators set by the internationally recognized tools. Education System Analysis (ESA) tools and guidelines introduced by UNESCO can be used for assessment purpose.

Implementing BNQF

The BNQF must be operationalized by the UGC, TMED, and NSDA with drafting a joint action plan for its respective level of occupation and education.

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2

COMPETENCY STANDARDS FOR NATIONAL TECHNICAL AND VOCATIONAL QUALIFICATIONS FRAMEWORK IMPLEMENTATION

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INTRODUCTION

Bangladesh has developed a partial qualification framework for the technical and vocational arena, titled as the National Technical and Vocational Qualifications Framework (NTVQF), aiming to produce a skilled and productive workforce in 2011. The minimum required educational qualification for accessing the NTVQF training framework is class eight or grade eight. Two pre-vocational levels are also appended with this framework in the Bangladesh context so that persons having hands-on skills can access to the pathway of the mainstream NTVQF system. After receiving pre-vocational training and achieving a certificate in the pre-vocational level from a recognized government certification body, the certified graduates have the provision to enroll in mainstream NTVQF levels.

Training and certification under NTVQF system start in 2012. BTEB acts as the standardization and certification body defined in National Skills Development Policy 2011. BTEB approved a total of 471 competency standards for 232 occupations. The training program is implemented through 521 Registered Training Organization (RTO) where training and assessment facilities are ensured during the accreditation of the institute and courses.

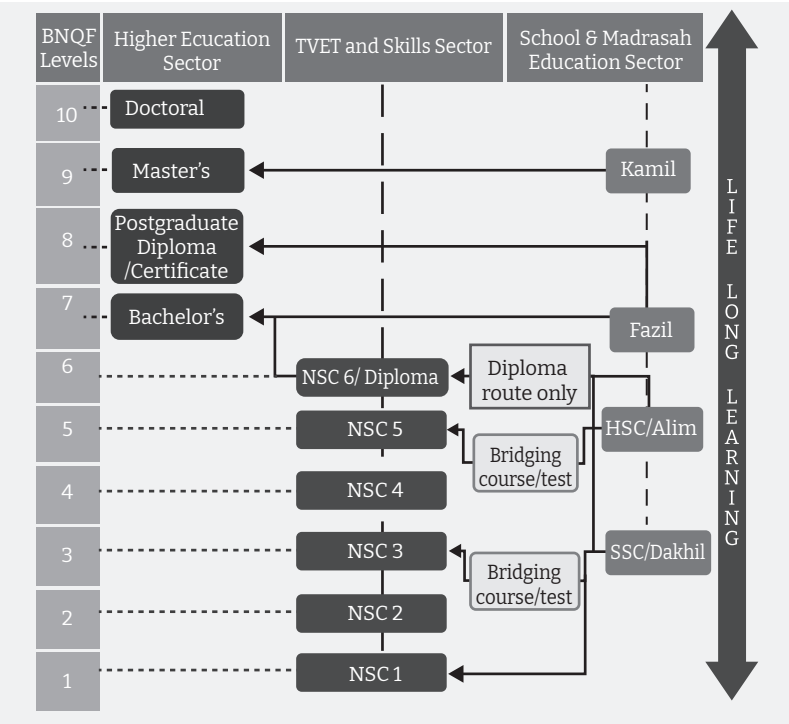
The BNQF structure is constituted based on three unique streams of education and training. The existing NTVQF system is merged and incorporated in a unique vertically articulated pathway named TVET and Skills (BNQF level 1 to 6) (see Figure 2.1). The other two new incorporated streams are higher education (BNQF level 7 to 10) and School and Madrasha Education (BNQF level 3, 5, 7, and 9), where the horizontal articulation of NSC certification provision in different levels under TVET and skills sector. This gave students or trainees the opportunity to achieve occupational/skills certificates through completing a bridging course or attending in challenge test as an RPL candidate, which is the indirect promotion of lifelong learning.

The government directed the Bangladesh Technical Education Board to align all technical vocational education programs such as SSC (VOC), HSC (VOC), HSC (BMT), and diploma courses with NTVQF/ NSC so that student can achieve a dual certificate and move to the vertical pathway of TVET and Skills sector by transferring the achieved credit.

For the new qualification system, credit for the competency unit must be accounted for, which is a missing parameter in the Competency Standard (CS) of the existing system. For smooth and proper implementation of occupational training, the quality of CS and Competency Based Curriculum (CBC), Quality Assurance Manual (QAM), Course Accreditation Documents (CAD), Quality of Competency-Based Learning Material (CBLM), assessment tools and the existence of other legislating and guiding documents like BTEB

act-2018, NSDA act-2018 and CBT&A implementation and assessment guideline including guideline for Recognition of Prior Learning (RPL) and e-RPL are very important documents and instruments. These documents and instruments play a vital role in implementing the training programs under the qualification framework.

Figure 2.1: BNQF Structure



Source: BNQF, 2021, Ministry of Education, Bangladesh

The competency standard related factors influence trainee enrollment, as well as the implementation and expansion of the NTVQF system. From perception, the affecting factors may include – fixed time course duration (360 hours) for all occupational levels, the

existence of the nomenclature of job classes in framework structure, substandard positioning of CS (Competency Standard) levels, too many levels in a single occupation, no provision of short duration (unit base) training and certification, missing of the credit system, and industry responsiveness/relevance of the CS.

This study finds how the CS-related factors like setting levels of the occupational standard, period of the unit of competency, and duration of the occupational courses affect the implementation of NTVQF.

The chapter is outlined in three following sections. Section two illustrates a literature review on competency standards and draws comparative analysis of the direct quality factors. Section three presents the competency standards related affecting factors. The fourth section highlights the consequences of the affecting CS factors, and the remedial measures. The conclusion is drawn in the final section.

COMPETENCY STANDARDS: EXPLORATION OF EXISTING LITERATURE

Bangladesh Technical Education Board (BTEB) has been implementing National Technical and Vocational Qualification Framework since 2012, using a competency-based training and assessment system. Like other successful implementing nations, BTEB in Bangladesh also uses competency standards as a national training and assessment regulation. After reviewing the CS of BTEB and other countries, it is found that competency standard consists of several components and factors. The components are the contents and the evidence guide. The contents are in the form of a unit of competency (UoC), elements of competency under the UoC, and performance criteria (PC), including range variable and condition/qualifier in the PC.

The evidence guide consists of a critical aspect of competency, underpinning knowledge and skills, required attitude, resource implication, assessment methods, and assessment context. The affecting factors are industry relevancy, course duration, occupational level, training delivery system, credit system, evidence guide for assessment, and certification. 'Competency Standards are nationally-recognized, industry-agreed definitions of competency. They define competency in three parts; the knowledge, skills, and attitudes workers need to possess (performance), which conditions it is to be done under (conditions), and how well it is to be done (industry standards)' (ILO, 2012).

There are many methods available for competency standard development, and the choice of method strongly influences the type of competency standards" (Gonczi et al., 1990, Section 6). BTEB mainly develop competency standard using the DACUM process and task analysis through TSC. BTEB followed mix mode of the DACUM process and functional analysis methods, usually within 2 or 3 steps through TSC and SCDC workshops.

Duration of the course is a very crucial and influencing factor related to competency standards. After reviewing the related CS of BTEB as well as competency standards and documents of other countries, it is found that course duration or nominal hours vary from course to course based on the amount of course contents and industry needs; it may be fixed or flexible. BTEB used fixed course duration for every occupation but found that other countries used need-based flexible course duration.

In a qualification framework, levels are mainly the present difficulty of learning and learning domains. The structure of qualification frameworks generally includes levels of complexity of learning outcomes, expressed as level descriptors. Domains are used

within qualifications frameworks to describe areas of learning. The domains for the level descriptors vary across qualification frameworks. The aspects of learning that are included in the domains (for each level) reflect each country's education and training qualifications and system" (Bateman & Coles, 2012). From a review of several countries' competency standards, it is found that the initial level or starting level of occupation varies from occupation to occupation and country to country.

Different countries use different training learning methods for delivering training program like Competency Based Training (CBT), Competency Based Education (CBE), Outcome Based Education (OBE), problem-based, project-based, and performance-based. In Bangladesh, CBT&A learning method used in NTVQF system." CBT methodology deviates from the traditional approach to education and training, placing a heavy emphasis on what a person can do in the workplace after completing the training program. Learners' progression within a CBT program is not time-bound; instead, it depends on the person's ability to demonstrate the necessary competence for the job. CBT focuses on assisting learners to develop and demonstrate competent performance as industry-approved competency standards require.

The evidence guide consists of critical aspects, underpinning knowledge, underpinning skills, required attitude, resource implication, method, and context of assessment. This factor also influences the implementation process of competency standards. "The evidence guide provides advice on assessment and must be read together with the performance criteria, required skills and knowledge, and range statement" (National Skills Quality Assurance System, 2011).

For implementing a national qualification framework for competency standard work as a means, it provides the guidelines and detailed training specification established by the relevant industry. 'Competency Standards are nationally-recognized, industry-agreed definitions of competency' (ILO, 2012).

The direct quality factors for Philippines, Sri Lanka, Australia, India, and Bangladesh are shown in the Table 2.1. The factors are analyzed by incorporating two aspects - directly related quality factors and indirect proxy factors. Directly related factors are the major quality components in CS, industry relevance, and quality of content. From the comparison, it is found that most of the identified factors are available in Bangladesh CS except missing the credit system. The overall quality is satisfactory and comparatively similar to other countries under study.

The study shows that the total number of NQF levels of Bangladesh, Sri Lanka, Philippines, and Australia are 10, 12, 8, and 10 respectively, where India yet not developed any NQF. Again, the number of NTVQF / VQF / NSQF levels of the above-mentioned countries are 06, 07, 05, and 06 respectively; India, their NSQF level is 10.

The starting level of graphic design occupation in the ICT sector in Sri Lanka, Philippines, Australia, and India are 04, 03,04, and 04, respectively. In contrast, it is 02 in Bangladesh and since 2020, it has been in level 01. After reviewing and analyzing the statistics of the competency standard, it is found that the occupation related to IT support comprises a single level, except in Australia it is two whereas in Bangladesh it is five. From this comparative data, it is clear that the occupations of the Bangladesh NTVQF system are suffering with too many levels of occupations that are not realistic and feasible to implement.

Table 2.1: Comparative Analysis of the Direct Quality Factors

Factors	Philippines	Sri Lanka	Australia	India	Bangladesh
Standard Code	No	Yes	No	No	No
Unit Code	Yes	Yes	Yes	Yes	Yes
Credit system	No	Yes	Yes	Yes	No
Unit Descriptor	Yes	Yes	No	Yes	Yes
EoC		Yes	Yes	Yes	Yes
PC / AC	Yes	Yes	Yes	Yes	Yes
Form of actions verb in PC	Passive	Passive	Active	Active	Passive
Condition/ Qualifier in PC	Yes	Yes	Yes	Yes	Yes
Range Variable	Yes	Yes	No	No	Yes
Critical Aspect	Yes	Yes	-	-	Yes
Underpinning Knowledge	Yes	Yes	Yes	Yes	Yes
Underpinning Skills	Yes	Yes	Yes	Yes	Yes
Required Attitude	Yes	No	No	Yes	Yes
Recourse Implication	Yes	Yes	No		Yes
Assessment Methods	Yes	Yes	Yes	No	Yes
Context of Assessment	Yes	Yes	Yes	Yes	Yes
CS Development Methodology	Mix of DACUM and Functional Analysis	DACUM	Mix of DACUM and Functional Analysis	Mix of DACUM and Functional Analysis	Mix of DACUM and Functional Analysis
Development Stage in NSQAS / Practice	4/4	4/4	4/4	5/5	4/3

Factors	Philippines	Sri Lanka	Australia	India	Bangladesh
Organized by	Central Authority (TESDA)	Central and Local Authority	Local Authority	Provincial Authority	Central Authority (BTEB)
Committees	-	National Industrial Training Advisory Committee	Industry Reference Committees (IRCs)	-	TSC and SCDC
Industry Involvement through	Industry Working Group	NITAC	Industry Association	Sector Skills Council	Industry Skill Council
Drafted by	TESDA Local Office	National Apprentice and Industrial Training Authority	Industry Association	Sector Skills Council	ISC Guided by BTEB
Approval authority / Endorse By	Central Authority	Central Authority	ASQA - Australian Skills Quality Authority	National Skills Development Commission NSDC)	Central Authority (BTEB)
Sufficiency, urgently and authenticity of the contents	Moderate	Moderate	High	Moderate	Moderate
Version change	within 01 to 03 years	within 02 to 3 years	Any time on demand from stakeholder and expelled previous version	Yearly where next modification date is mentioned in current Version	On demand and very frequently for IT and RMG sector but not routine practice.

Source: Physically collected CS of BTEB and TVEC of Sri Lanka and Online Search for the CS of Philippines, Australia, and India

In Bangladesh, the starting level of the occupation electrical installation and maintenance/electrician is in level 1. However, other countries start it from level 3; only in Philippines starting level is level 2, and in India from level 5. After reviewing the other country's competency standard, it is found that the occupation IT support or similar course has only one level except in Australia it is two whereas in Bangladesh it is maximum five.

A comparison among occupation plumbing, it shows that starting level and the number of levels of the occupation plumbing varies from country to country. In Bangladesh it starts from level 1 and has 4 levels of competency. Starting level in Philippines, Australia, and India respectively 1, 3 and 2 and it also found that like Bangladesh, other country has multiple levels of competency.

In Bangladesh and Philippines, the level of the welding occupation started from 1, and in India, Australia, and Sri Lanka, it started from level 2, and it is also visible that all the countries under study have multiple levels in this specialized occupation.

There is a large number of CS-related factors that influence the implementation process of NTVQF. From the above discussion, it is identified that CS quality, duration of the course, and starting level are influencing factors. The quality of CS in Bangladesh is acceptable to the user in the context of industry relevancy. The development process of CS is also acceptable, but the duration of the training, levelling of the standard needs to be adjusted.

From the above comparative analysis, it is clear that the existence of pre-determined same training durations (360 hours) for all occupations is not under-practiced in the CS of those countries. The fixed and same duration training course for all levels of all occupations concept is not found elsewhere in the globe except Bangladesh. Even in some countries duration of the training course is not mentioned in the CS of central authority but determined by the training institute,

and before or after enrollment, the training institute determines the duration of the training by taking the pre-requisite level test of the candidate according to the requirement of a particular group of trainees. Australia and Sri Lanka have the training and certification provided for a unit or under packaging in a cluster of units, making them more feasible and flexible for bringing all types of training stakeholders under qualification framework (QF).

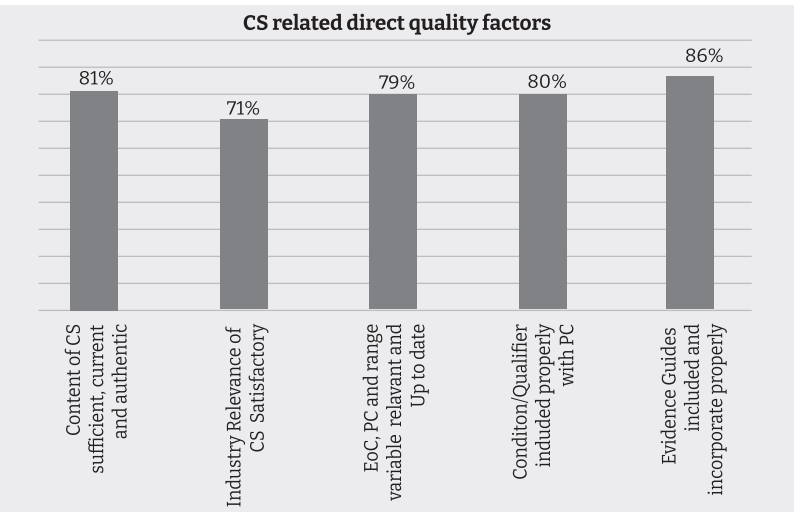
From the comparative analysis, it is also found that almost all successful QF implementing nations set their occupations within one or two levels comprising complete job roles, whereas it is found a maximum five levels in Bangladesh. The initial level of the occupations in the countries under study started in different levels of qualification framework considering the complexity and higher order hands-on as well as cognitive skills. However, in Bangladesh for most cases, initial levels of the occupations are weighted with a lot of higher-order hands-on and cognitive skills, many of those are not suitable for the initial level. The prerequisite academic qualifications for entering in QF in most countries are minimum O levels/grade 10, whereas in most cases, it is grade 8 in Bangladesh without any feasibility and maturity of the trainee for entering and receiving occupational training.

QUALITY OF COMPETENCY STANDARD AND AFFECTING FACTORS

The primary data collected through semi-structured questionnaires are analyzed in this section, where the opinion of CS development process experts, certified master trainers, and certified senior assessors of different occupations are addressed and accommodated. After analyzing the collected data, it is found that regarding the quality factors of the CS, among the respondents in this study, 81% agreed or strongly agreed that the quality of CS in Bangladesh is sufficient, current, and authentic. 71% agreed that the CS is satisfactory, acceptable, and easily interpretable to the user in the context of

industry relevancy, sufficiency, current, and authenticity. 79 %of respondents agreed that the UoC, EOC, PC, Range Variable are relevant and up to date, and 80% respondents strongly agreed that condition/ qualifiers are included properly in PC, and 86% respondents strongly support that evidence guides as critical aspect of the competency, underpinning knowledge and skills, required attitude, resource implication, method of assessment and context of assessment are included and incorporated properly in CS.

Regarding the questions about the position of the starting NTVQF level, only 32% of respondents supported that starting level of his/ her occupations is justified, and similarly, only 46% of respondents uttered that the unit level is appropriately placed. In response to the question of whether only activity base task elements need to be placed in performance criteria (PC), 54% of respondents suggested that both performance-based hands-on and cognitive skills need to be placed in PC, and the related cognitive knowledge of those skills should be included in underpinning knowledge.



Source: CS quality-related field survey

In response to the question about the interpretability of the template of the CS, 76% of respondents agreed that the template/ format of the competency standard is easily understandable. 24% of respondents said that templet is difficult to interpret by them.

Regarding the question about the steps in the CS development process, 94% of respondents agreed that all the 4 steps- need analysis of the occupation; task analysis; drafting CS and CAD by TSC workshop; validation of the draft CS and CAD by the stakeholders; and finalizing CS and CAD by SCDC workshop for approval need to be strictly followed, practiced, and maintained during the preparation of CS.

In response to the question on the necessity of developing a competency-based curriculum based on competency standards, same as the previous response, 94% agreed that this is an essential requirement for better understanding by the teachers and the students.

The most discussed issue in this research is the question asked to the respondents whether the predetermined fixed and same training duration (360 /270 hours) for all occupations or a unique type of practice in the Bangladesh NTVQF system, is justified or not. 73% of respondents disagreed with this approach, and 82% of them suggested that the duration of training standard should be determined based on a complete job role and must be varied from occupation to occupation and level to level.

The study shows that 86% of respondents agreed with the proposal of introducing unit-based training and certification. It is demonstrated in the overall responses regarding the modality of assessment and certification, where 56% of the respondents suggested continuing the current practice of level-based assessment and certification with the provision of unit-based assessment and certification, 15% suggested occupation based assessment and certification (all levels' assessment

and certification at a time after the end of full occupational course), 19% suggested unit clustering or packaging type of assessment and certification, only 8% of respondents suggested independent unit base assessment and certification which was 86% in the previous response, but they agreed to introduce several options in assessment and certification for popularization of NTVQF.

Though many CS-related direct influencing factors exist but have little impact on implementation, some proxy factors established through consultation and in the direction of foreign experts continue to have a significant impact on the popularization, implementation, and expansion of NTVQF in Bangladesh. Regarding the quality aspect of the CS, the respondents agreed that industry relevance is more or less satisfactory, and CS's contents are sufficient, current, and authentic. Similarly, the components of a CS, such as the unit of competency, elements of competency, performance criteria range variables, conditions/qualifiers, and evidence guide of the CS are also quite good and acceptable.

The fixed and same duration (360 hours) training course for every occupation, level-based training instead of the provision of unit-based training as well as certification, substandard positioning of the levels, too many levels in a single occupation, setting higher order complex, inappropriate and unjustified competency units in very initial levels, the existence of nomenclature of the job class in qualification framework and in some cases substandard prerequisite qualification are the major CS related influencing and affecting factors in Bangladesh NTVQF system.

- **Same Duration Courses for all Occupation:** 360/270 hours fixed duration training course for each occupation is one of the main affecting factors in implementing of NTVQF in Bangladesh. This unique approach is maintained only in Bangladesh, which directly affects the popularization and

expansion. The stakeholders running customized short-term courses feel discouraged to come under this long-time course duration under qualification framework, and the consequence of this factor ultimately create constraint in implementing NTVQF in Bangladesh. Another problem is that the process experts usually lengthen or shorten the originally required duration for maintaining its predetermined (360 / 270 hours) fixed duration for a level.

- **Only Level Based (Single option) Training, Assessment, and Certification Provision:** Only level-based training provision instead of the flexible options of unit-based / full course training and certification provision is another significant constraint of the expansion NTVQF system in Bangladesh.
- **Substandard Leveling of the Courses in Job Class:** Some training courses such as IT support, computer operation, and graphic design occupation were placed in level -1 in the job class of the NTVQF system and treated as a basic worker which undermined the candidates and demotivated them to train and certify as a Basic Worker. This substandard position of the graduates in job class keeps them out of the NTVQF system.
- **Excess of Levels in a single Occupation:** From the secondary analysis of the courses in different countries, it is found that a single occupation comprises all the job roles required to work in a designated position, and level of that occupation usually not exceed maximum two levels. However, in Bangladesh, the occupations, for example, IT support are divided into maximum of five levels, which is invalid and not justified at all. It is observed that the contents of computer operation, computer assembler, ICT officer, hardware technician, network supporter, network engineer etc. are accommodated in a single occupation namely IT support and extended it up to

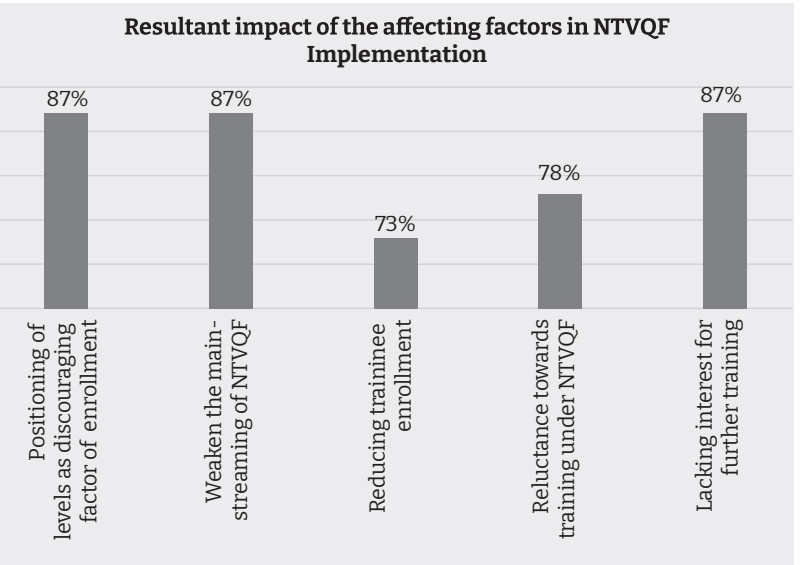
level 5. This too many levels in a single occupation is another constraint for expanding the NTVQF system in Bangladesh.

- **The burden of higher order Skills and Competencies in Level 1:** Bangladesh NTVQF system initial level (Level 1) suffers from the extra burden of skills and competencies. For example, RAC, Welding, EIM, plumbing etc., occupations started in level 1 with a huge number of higher order hands on as well as cognitive skills and competencies. This extra burden is harm to a trainee. Setting higher order complex, inappropriate and unjustified competency units in very initial levels frustrated the trainee and ultimately slowed the implementation of the NTVQF.
- **Existence of Nomenclature in Job Class:** The existence of the job class in the qualification framework is not found in any country except Bangladesh, where Job classes like Basic Worker, Basic Skill Worker, Semi Skill Worker, Skill Worker, Highly Skill Worker, and Mid-Level Managers are mentioned as the nomenclature of Job. This substandard naming of Job class discourages the higher educated youth from enrolling in training under the qualification framework
- **Inappropriate Pre-Requisite Qualification:** Substandard pre-requisite qualifications (Class VIII) for some sophisticated occupation is also an influencing factor against the expansion and implementation of NTVQF system in Bangladesh.

CONSEQUENCES AND REMEDIAL MEASURES

The study shows that 87% of the respondents agreed that due to substandard positioning of level, the trainees do not feel interested in enrolling in training under the NTVQF system; similarly, same percentage of respondents believe that the factors weaken the mainstreaming of NTVQF as well as lose their interest of further

training after achieving first certificate. On the other hand, 78% of respondents believe that the factors make resistance towards training and 73% said that it reduces the trainee enrollment under the qualification framework. These factors creating unwillingness towards training, make an obstacle to expansion of training under the qualification framework. Ultimately nation deprives of the quality graduates and competent human resources in Bangladesh.



Source: CS quality-related field survey

To popularize competency-based training and assessment, increase enrollment, expand the NTVQF system to mainstream education, and bring all short-term, intermediate-term, and long-term training provisions under the national qualification framework, the implementing authority and the government must introduce and adopt significant adjustments and innovations.

Regarding the question about the salvation of the problem and change requirements, almost all respondents strongly agreed with the following remedial measures for improvising the CS and other related factors. The highest 97% of respondents said that occupational training duration should not be similar and should be fixed for all occupations. The duration of occupational standards might be varied from occupation to occupation according to the industry requirement.

Universal opinion is (92%) that occupational levels should not always be started at level 1, instead may be started at different levels based on level descriptor's compliance, substandard positioning of occupational levels should be avoided, and levels must be determined following level descriptor's guideline. Every nine in ten respondents believe that occupational standards should cover a particular complete Job role so that the graduates can work independently for a particular designated position. 89% of respondents said that a notional hour is more justified than a nominal hour in an unit of competency of an occupational standard. 87% suggested introducing a credit system for each unit of competency of an occupational standard so that the graduates can utilize/enjoy or transfer the achieved credit in his/her further training and education as credit waiver when required.

Almost three quarters (74%) of respondents suggested that the existing level descriptor of NTVQF should be modified and restructured in the light of the national context, and the job class should be eliminated from the framework structure, so that the training candidate/graduates never feel that they or their certificates are substandard by the job class definition.

CONCLUSION

This research work is an important instrument where the affecting CS-related factors and some by-product other national levels acute influencing factors are addressed and identified. The findings

included a number of issues and challenges which need to be considered during the revision and new development of the CS. Some reformation in implementation guideline and manuals need to be accomplished immediately, including that the initial level of qualification not always be set/started from level-1, rather in different appropriate level(s) according to the criteria defined in the level descriptor of the qualification framework. Avoiding substandard positioning of occupational levels and removing the name of job class also very important suggestion.

The most affecting factors in this research is the course duration and contact hours. From the practical experience of implementation, since 2012 and lessons learned from other countries, we should rethink the related issue and way forward to mitigate the problems.

Based on the research findings- the identified CS-related affective factors, consequences of the affective factors, and remedial measures need to be considered for further actions and research as mentioned below.

- All training duration should be occupation independent with the provision of level independence when required and should have the flexibility to customize the duration based on level test/gap analysis results determined by the instructor/ authority of the training institutes.
- Fixed duration training (360/270 hours), common for all occupations, in practice only in Bangladesh, needs to be expelled. The duration might be varied from occupation to occupation and level to level as per industry requirements comprising complete job roles as practiced by the other successful implementing countries like Australia, Philippines, and Sri Lanka.
- Too many levels in an occupation are one of the main constraints of popularization and expansion of the NTVQF system. Multiple

entries and multiple access in different levels for single occupation are not feasible in Bangladesh. Moreover, this is not also in practice in other countries. So an occupational standard should cover all the related job role and might be completed within a single level, which is the best option for implementing the qualification framework as practiced in Singapore, and if not possible, the number of levels need to be limited within the highest three as practiced in Sri Lanka, Philippine, Australia, and India.

- Unit Based Training and Assessment need to be introduced in Bangladesh so that the institute as well as the candidate take the opportunity of flexibility to arrange/conduct and enroll in very short, short, and long-term training provisions based on industry demand as well as requirements of individual institutes, the development partners, the donor, and the candidate himself.
- CS Revision interval needs to be reduced and done very frequently within one year or six months when real-time change requirement demand is requested, and version control needs to be introduced in CS by mentioning the date of the next revision and producing the next version.
- Occupation code and unit-based credit need to be added in the format of existing CS in Bangladesh
- CS in Bangladesh NTVQF system is overburdened with too many steps of task elements that should actually in the Competency Based Curriculum (CBC). So, to maintain the international practice and comply with the writing philosophy of CS contents, the steps under an element of competency need to be limited within 5. If required further breakdown of the PC need to be done in CBC.

- CBC development needs to be mandatory for the Bangladesh NTVQF system for better understanding by the teachers and the students.
- Some very popular occupations developed initially from 2012 to 2017 (Graphic Design, IT Support, Computer Operation, Electrical Installation, and Maintenance, Dressmaking and Tailoring, Plumbing, cooking etc.), need to be revised as well as uplifted in the appropriate level immediately.

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3

SUBJECT-BASED TEACHER'S TRAINING FOR GOVERNMENT POLYTECHNIC INSTITUTES: STATUS, CHALLENGES, AND WAY FORWARD

Md. Rakibul Hasan
Md. Abdur Rahman

INTRODUCTION

The expansion and promotion of technical education in Bangladesh and its importance have increased in recent years. The number of trainings for making subject-based skilled teachers has also increased. Yet, teachers face many challenges regarding quality training in TVET institutions, especially in the Diploma in Engineering course from which Bangladeshi mid-level engineers are produced. Even teachers are not fully aware of the NTVQF levels of skills. For diploma graduates to succeed in the field of work, it is necessary to have diverse skills—computer skills, management skills, technology-based skills, programming skills, leadership and communication skills, specially the English language for real life (BTEB, 2021).

Two institutions Technical Teachers Training College (TTTC), Tejgaon, Dhaka (Established-1964) and another is Vocational Teachers Training Institute (VTTI), Bogra (Established-1979) offer education, training, and skills development programs relating to a wide range of occupational fields, production, services, and livelihoods. Currently 54028 teachers are working in various TVET institutes in Bangladesh, out of which 10915 are female teachers. Among them, the total number of teachers with Diploma in Engineering is 12022, and the number of female teachers is 2071 (17%).

There are certain challenges to teacher's subject-based training in technical education along with a big difference in how those challenges can be overcome. It is crucial to identify the status and challenges of subject-based teacher' training in Bangladesh and find solutions to overcome these challenges. To that end, the primary aim of this study is to explore the status and challenges and the way forward of subject-based training of government polytechnic institute teachers in Bangladesh.

Using mixed method, participants were asked, in general, what are the challenges and remedies of subject-based teachers training in polytechnic institutes in Bangladesh. The teachers were selected from 50 Government polytechnic institutes in the different districts of Bangladesh. Teachers were chosen purposively considering who have participated in one or more training, at home or abroad, in the last three years. This study includes teachers from government polytechnic institutes as well as maintaining the representation of the gender perspective statistically. This study provides information about respondents' feedback on previous and current subjective training issues and challenges of training and suggests ways to make future training sustainable. In addition, the study describes the current condition of TVET (Diploma in Engineering) teachers' subject-based training in technical and vocational education and

training, as well as the challenges to this participation and the means to overcome them.

This study consists of three sections. Exploring the secondary literature, the second section showcases the strategies of subject-based teacher's training. The third section states the current status and challenges of government polytechnic teacher's subject-based training. The last section concludes and puts forward recommendations to overcome challenges in ensuring quality subject-based teacher's training.

STRATEGIES FOR ENHANCING QUALITY SUBJECT-BASED TRAINING

A continuous upgradation in training is highly required to meet the industry's present and future needs. The skill development process will only be sustainable, once there is continuous training assessment. To be responsive to present and future needs, the skill development system of Bangladesh is moving forward to implement a Competency-Based Training and Assessment (CBT&A) system. The CBT&A system is more focused on demand-driven training than traditional training. Specific demands are being initiated from the industry, and CBT&A is fulfilling the request by providing specific skills. CBT&A is shifting from the traditional theory-based approaches to delivery and assessment approaches by emphasizing the achievement and demonstration of practical skills required to perform at a specified standard demanded by the industry. The CBT&A system in Bangladesh is based on the following principles (NSDP, 2011). Progression through a competency-based training program will be determined by whether the student has met the set standards and not by the time spent in training.

Training is required for trainers so that they can develop and implement CBT&A programs to their respective institutions. The government should also invest more funding to upgrade the equipment and other facilities so that the training outcome can meet

the industry's demand. A new certification system for instructors and trainers has been adopted to deliver a more strategic approach to developing the training workforce. This new system ensures that the same standard, programs and qualifications are applied to all instructors and trainers working in the public and private sectors. These qualifications are also recognized by the new NTVQF. Some certified trainers are essential to disseminate the skills throughout the country. This new system is expected to ensure an upward trend of the skilled professional workforce by imposing the following conditions (Ministry of Education, 2011, 28-29).

- All government instructors are being trained and certified under the new system.
- A national network of instructor training centers is established that integrates existing instructor training facilities separately managed by different government Ministries and agencies.
- A pool of certified national Master Trainers is created to implement the new instructor training programs, including a separate group of master trainers for the disabled. To update the trainers' knowledge, the government set a mechanism with the industries called the 'return to industry' program that allows current instructors and trainers to update their technical skills in the workplace.

Establishing equal access to professional development, female trainers are given priority in the CBT&A system. The government has taken the initiative to employ female instructors in the new vacant posts with a view that women are better represented as instructors and trainers in the skills system. Private training sectors occupy the significant portion of the skill development area in Bangladesh. So, trainers from non-government training organizations are encouraged to join the mainstream national skill development program to

improve the skills and overall quality of training delivered to students (Khan *et al*., 2017)

Collaboration between educational institutions and industries is to be increased (Raihan, 2014). Governments should encourage industrial organizations to join TVET by providing incentives, subsidizing apprenticeship wages, and assisting the stipend program (Islam, 2014). Infrastructural development of educational institutions needs to be done with hostel facilities, sanitary facilities, and modern equipment (Islam, 2014).

Links between training and the employment sectors are of prime importance in establishing an agreeable environment and win-win situation for the training graduates and the employers. The market requirements are changing specially with training curricula, trainers' skills, market linkages, etc. In order to promote employment with appropriate and needed skills, employers and enterprises (Industry) engagement in TVET should be emphasized.

SUBJECT-BASED TRAINING: STATUS, CHALLENGES, AND STRATEGIES

This section analyzes the primary and secondary data and presents the data addressing research questions-current status of subject-based training of government polytechnic teachers in Bangladesh.

Teachers' Training and Participants

There are 50 Government polytechnic/similar institutes located in different districts in Bangladesh. About 1425 instructors, of which 81% are male teachers (1155) and 19% are female teachers (270), work in these institutions (BANBAIS, 2020). In Bangladesh, there are two government-run teacher training institutes located in two districts. Among those, one is the Technical Teachers Training College (TTTC), Tejgaon, Dhaka and another is the Vocational Teachers Training College

(VTTI), Bogra. The two institutes provide various types of training such as subject-based training, foundation training, and procurement training (Table 3.1).

Table: 3.1: Types of training for the teacher, duration and venue

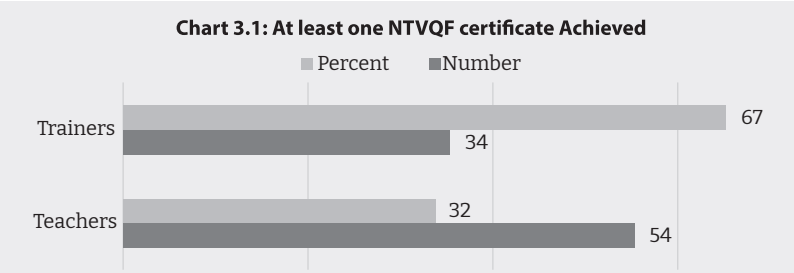
Subject of training	Duration	Training Venue
Basic training	60 Days	BIAM
	30 Days	TTTC
Subjective training	7 Days	TTTC+VTTI
	30 Days	DPI+VTTI
	60 Days	TTTC+VTTI+ DPI+DMPI
Project management training	10 Days	ILO
Innovation in Public Service Training	7Days	ILO
Basic office management training	7Days	BIM
E-GP training	3 Days	Dohatech New media
PPR + Project Management training	14 Days	
PPR training	21 Days	CPTU
Cyber Security and Ethics training	7 Days	IUT Gazipur

Source: DTE

The questionnaires were provided to verify the number of trainings received by the respondent teachers of the polytechnic institutes. Out of 169 respondents, about half (49%) of the teachers received five to ten training, and 39% received one to five training. It is important to note that 9% of the teachers did not receive any training.

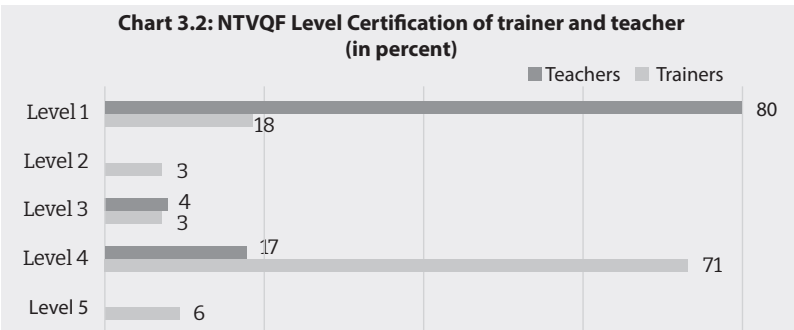
NTVQF Certification status of Trainers and Teachers

The respondents' (n=220, teacher=169, trainer=51) opinions were taken to consider the NTVQF level certification status of the trainer and teacher and also considered which level of certification they received. The result indicates that 32% of teachers gained at least one NTVQF Certificate and 58% did not receive any NTVQF Certificate. Surprisingly only 67% of the trainer earned at least one NTVQF Certificate and 33% did not receive any NTVQF Certificate (Chart 3.1).



Source: Field Survey 2022

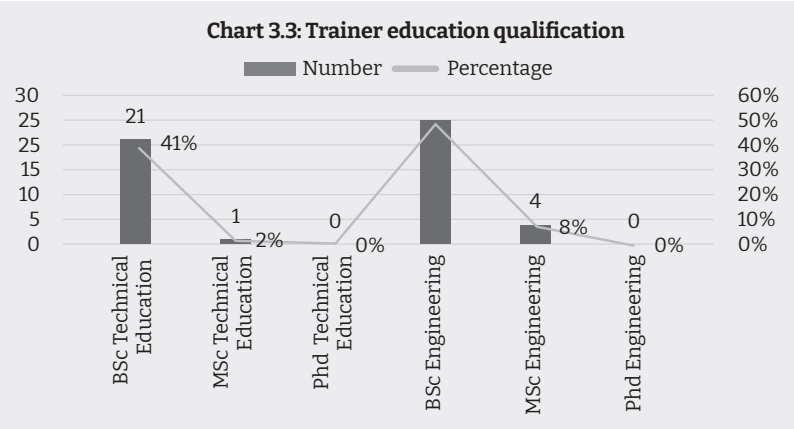
Among the teachers and trainers who received at least one NTVQF Certificate, only 17% of teachers gained up to Level-4 NTVQF Certificate, 80% received NTVQF Level-1 certificate, and 4% Level-3 certificate. Among the trainer, about 71% trainer gained up to Level-4 NTVQF certificate and 18% received NTVQF Level-1 Certificate, and 3% gained both Level-2 and Level-3 certificate (Chart 3.2).



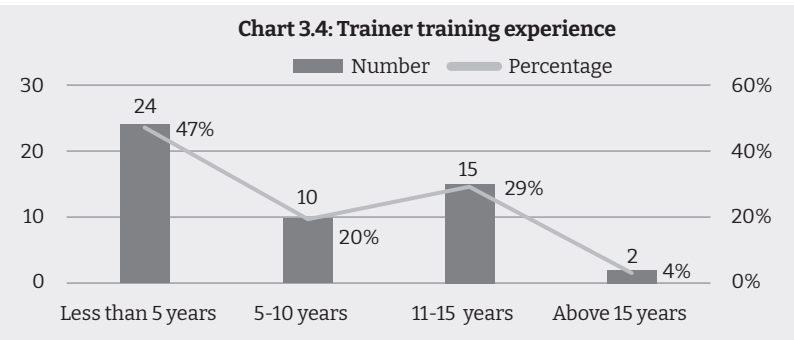
Source: Field Survey 2022

Educational qualification of trainer

Data on the educational qualifications of the trainers participating in the study have been collected. The number of the trainer was 51. Chart 3.3 indicates that about half (49%) of the trainers' educational qualifications were BSc in Engineering, 41% were BSc in Technical Education, and 8% were MSc in Engineering.



Source: Field Survey 2022



Source: Field Survey 2022

Training experience

The questionnaires were provided to justify the training experience of a trainer of the training institutes. Out of 51 respondents, all the respondents were trainer of government training and polytechnic institutes located in various districts in Bangladesh. Chart 3.4 indicates that about 47% of the trainers' training experience was less than five years, 29% of trainers' experience was eleven-fifteen years, and 20% was five to ten years. Only 4% of the trainers' experience was above 15 years.

In all the training institutes training satisfaction level is between Neutral to Satisfied, and significant matter is that the NTVQF training quality is above the satisfaction level. From this, it can be concluded that the training of the NTVQF method brings good results in the subject-based skills of teachers (Table 3.2).

Table 3.2: Satisfaction with subject-based training

Training institute	N		Very Satisfied	Satisfied	Neutral	Dissatisfaction	Very Dissatisfaction	Weighted mean	Mean2	Std. Deviation
Subject -based training of TTTC	152	f	10	112	26	4	0	3.8	15.08	3.35
		%	7%	74%	17%	3%	0%			
Subject -based training of VTTI	105	f	12	69	22	2	0	3.9	15.33	3.39
		%	11%	66%	21%	2%	0%			
Subject -based training of DPI	77	f	4	50	13	4	6	3.5	13.49	3.15
		%	5%	65%	17%	5%	8%			
Subject -based training of DMPI	56	f	3	45	5	2	1	3.8	15.16	3.36
		%	5%	80%	9%	4%	2%			
Subject -based training from other institute	18	f	2	8	2	5	1	3.3	12.06	2.96
		%	11%	44%	11%	28%	6%			
NTVQF level subject based training of TTTC	26	f	7	13	4	2	0	4.0	16.42	3.53
		%	27%	50%	15%	8%	0%			
NTVQF level subject based training of VTTI	20	f	9	11	0	0	0	4.5	20.05	3.95
		%	45%	55%	0%	0%	0%			
NTVQF subject training from other institute	13	f	2	5	6	0	0	3.7	14.15	3.23
		%	15%	38%	46%	0%	0%			
In house subject – training (Own Institute)	114	f	18	83	13	0	0	4.0	16.62	3.55
		%	16%	73%	11%	0%	0%			

Source: Field Survey 2022

Challenges of subject-based training

The respondents (N=241) opinions were taken under consideration for statements related to institutional and governmental challenges of subject-based skills training faced by government polytechnic teachers in Bangladesh. The challenges are inadequate infrastructural facilities such as classroom & hostel; insufficient workshop facilities such as training materials, machines, and equipment; insufficient ICT facilities for teachers training; training curriculum not match with industries' demands; technology/ subject-specific limited training scope; unavailability of teachers' training institute; lack of training facilities for female teachers; lack of sufficient number of subject-wise trainers; lack of industry experience of training institute's subjective trainer; insufficient funding of training programs; lack of planning and adequate monitoring and management of teachers training.

Strategies of enhancing subject-based skill training of government polytechnic teachers

In response to the question, "What strategies can be taken for effective Subject-based Teacher's Training for Government Polytechnic Institutes in Bangladesh?", the respondents (N=241) opinions were taken into account under thirteen items pertaining to institutional and government challenges of subject-based training for Government polytechnic teacher in Bangladesh. The respondents opinion are: must have sufficient infrastructural facilities such as ICT based classrooms, hostels, and workshops; the number of trainees needs to be nominated according to the facilities of trainers, classrooms, and workshops; there should be workshop facilities with modern equipment to enhance practical training; every technology or subject-specific training opportunity must be insured; needed to set up world class Teachers' Training Institute in every division with all

modern facilities; organizing Problem-Based Learning (PBL), Work-Based Learning (WBL), and Project-Based Learning (PBL) trainings, organize training and retraining of teachers at regular intervals; training curriculum needs to be subject-oriented; an adequate number of subject-wise skilled trainers (training institute) need to be created; subject-based training can be made compulsory for every teacher up to a specific NTVQF level/limit; adequate funding needs to be allocated in the budget for subject-based training of teachers; needed to maintain planning and adequate monitoring of teachers' training; research on teachers' training needs to be continued on a regular basis to create quality teachers.

Teachers' Need for Industry Attachment and NTVQF Level of Certification

The respondents (n=241, Teacher=169, trainer=51, Principal=21) opinions were taken for the analysis of scopes of teachers training through industry attachment and possibility to make the teachers appropriately subject-based skilled in training through the NTVQF level of certification. The result shows that most respondents think teachers need subject-based training through attachment to the industry and it is possible to make the teachers properly subject-based skilled in training through the NTVQF level of certification. Most of our key informants have also in line with the importance of teachers' industrial integration and NTVQF level of certification. Subject-based training will enable teachers to become proficient if they can be trained through industrial attachment.

CONCLUSION

The present status of subject-based training for government polytechnic teachers in Bangladesh, the barriers to this training, and how to overcome these barriers were explored in this study. The study

finds that a shortage of teacher training institutes in Bangladesh considering to number of polytechnic teachers. Teachers received various types of training. This training includes different types of training, including subject-based training. There is a considerable shortage of subject-based training for Bangladesh Polytechnic teachers.

A large portion of the teachers have not yet achieved NTVQF certification and another significant fact is that a substantial portion of trainer does not have NTVQF certification. There is not much difference in the qualifications of teachers and trainers. Most of the trainers' training experience is below five years. The most interesting thing is that very few trainers had training experience above ten years. There is a shortage of experienced trainers of the desired quality in teachers' training

The study reveals that the training 'institutes' satisfaction level for training is between neutral to satisfied. It is noteworthy that the NTVQF training quality is above the satisfaction level. From this, it can be concluded that the training of the NTVQF method brings good results in the subject-based skills of teachers though there is no standard institution for subject-based training of Bangladesh Polytechnic teachers.

Subject-based training of government polytechnic institutes in Bangladesh faces some governmental, educational institutions, teachers and trainers related challenges. The challenges of subject-based training of government polytechnic institutes in Bangladesh were identified.

- Insufficient infrastructural facilities, such as, classroom & hostel; and workshop facilities, such as, training materials, machines, and equipment, and ICT facilities for Teachers' Training;

- Limited scope for technology/subject wise training;
- Unavailability of Teachers training institute;
- Lack of sufficient number of subject-wise trainers who can teach theoretical and practical work thoroughly;
- Lack of industry experience of training institute's subjective trainer.
- Insufficient funding for training programs.
- Lack of training facilities for female teachers;
- Incompatibility between training curriculum and industry demand; and
- Lack of planning and adequate monitoring, and management of Teacher Training;

The above findings established that infrastructural problem, especially hostel and sanitary facilities, machines, tools, and equipment facilities, and training materials are main institutional challenges of teachers' training. Lack of qualified trainers and industry-institute linkage are another mentionable problem of training institution.

Based on the findings, the following recommendations are made:

- Training institute's capacity needs to be enhanced, especially accommodation/hostel facilities, sanitary facilities, classroom and workshop facilities;
- Collaboration between educational institutions and industries is to be increased. Governments need to encourage industrial organizations to participate in subject-based training by providing incentives, subsidizing apprenticeship wages, and assisting the stipend program;
- Training institutions must have sufficient infrastructural facilities such as ICT-based classrooms, hostels, and workshops;

- The number of trainees needs to be nominated according to the facilities of trainers, classrooms, and workshops;
- There should be workshop facilities with modern equipment to enhance practical training;
- Needed to set up quality teachers training institute in every division with all modern facilities;
- Organizing Problem-Based Learning (PBL), Work-Based Learning (WBL), and Project-Based Learning (PBL) training; Organize training and retraining of teachers at regular intervals;
- Subject-based training can be made compulsory for every teacher up to a certain NTVQF level/limit
- An adequate number of subject-wise skilled trainers (training institute) need to be created who can teach theoretical and practical work completely;
- Adequate funding needs to be allocated in the budget for subject-based training of teachers;

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4

FEASIBILITY OF FLIPPED CLASSROOM APPROACH IN ELECTRICAL AND ELECTRONIC ENGINEERING COURSES

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Abdur Rouf
Salman Fazle Rabby

INTRODUCTION

A flipped classroom is a blended learning strategy that aims to increase student engagement and learning by having students' complete readings at home and work on live problem-solving during class time. This pedagogical style incorporates activities, including previously considered homework, into the classroom. In a flipped classroom, students watch online lectures, participate in online discussions, or conduct research at home while actively engaging in classroom concepts under a mentor.

The flipped classroom intentionally shifts instruction to a learner-centered model, in which students are frequently introduced to new topics outside of school, freeing up classroom time for more in-depth exploration of topics, and creating meaningful learning

opportunities. 'Content delivery' in a flipped classroom can take many forms, including video lessons prepared by the teacher or third parties. However, it can also include online collaborative discussions, digital research, and text readings. The most widely reported study of optimum video length found 6 min or less video segments had the most positive outcomes (Slemmons, et al., 2018).

In-class activities are also reimagined in flipped classrooms. To engage students in the content, in-class lessons accompanying flipped classrooms may include activity learning or traditional homework problems, among other practices. Class activities may include: using math manipulative and emerging mathematical technologies, conducting in-depth laboratory experiments, analyzing original documents, presenting a debate or speech, discussing current events, peer-reviewing, project-based learning, and skill development or concept practice. Because these types of active learning enable highly differentiated instruction, more time in class can be spent on higher-order thinking skills such as problem-finding, collaboration, design, and problem-solving. As a result, students can tackle difficult problems, work in groups, conduct research, and construct knowledge with the assistance of their teacher and peers.

In a flipped classroom, a teacher's interaction with students can be more personalized and less didactic. Students are actively involved in knowledge acquisition and construction as they participate in and evaluate their learning.

In a flipped classroom, however, instructors can deliver some lectures via an online platform, allowing students to spend the majority of their class time brainstorming, doing group activities such as group projects, or conducting experiments, which will eventually teach them how to apply their textbook knowledge in the real world.

In this chapter, we will discuss the concept of blended learning; the steps to creating a blended learning program; the benefits of a

blended learning environment; challenges in implementing blended learning programs at HEIs of Bangladesh; and finally, recommend some policies to overcome the identified challenges. The study's specific goal is to analyze the feasibility of flipped classroom learning approach for Bachelor in Electrical & Electronics Engineering courses at ECs in Bangladesh.

The study is exploratory in nature and uses both quantitative and qualitative data. It is both descriptive and empirical. The data was collected using a multi-method design based on the nature of the data sources, which means quantitative data was collected from students using a semi-structured questionnaire because students find it easy to answer concisely. On the other hand, qualitative data was collected from teachers, principals, and IT experts in order to collect detailed answers about the feasibility of flipped classrooms.

This chapter is organised in four sections. The following section presents the findings on the factors that influence students and teachers' willingness to use a flipped classroom approach and what its attendant benefits are. Section three identifies the necessary facilities and challenges for implementing the FC approach. Section four summarises the major findings and concludes.

FACTORS OF SCOPES USING FLIPPED CLASSROOM APPROACH

The study's findings on the factors influencing students and teachers' willingness to use a flipped classroom approach will help students, teachers, and principals in understanding why flipped-classroom should be implemented, and what the benefits of this educational system are.

Accessibility

The first essential difficulty in determining the scope of applying the FC strategy is the technical accessibility.

Personal Accessibility: Most of the teachers, students and principals have a good attitude regarding this indicator. This study found that the "majority of students have the accessibility of personal laptop/desktop, smartphone, internet connection of moderate speed and used to with social media, Google forms, email services, YouTube, and Google."

According to Fatema et al. (2020), 94% of Bangabandhu Sheikh Mujibur Rahman Science and Technology University respondents in Gopalganj, Bangladesh, have internet connectivity and utilize it regularly. However, according to Raihan (2013), just 10% of respondents used the internet in 2013. However, the current situation has drastically changed.

One teacher commented on technology accessibility, "Currently Bangladesh has enough technological supports with less expenditure, because students have enough access to technology and this is a prerequisite to implementing the flipped classroom approach." Furthermore, it has been stated via KII with principals that nearly all students have their laptops or desktop computers, and nearly all students have smart phones with internet access. In particular, during the corona pandemic, the usage of these technologies spread rapidly.

Institutional Accessibility: This indicator aims to determine technology accessibility, such as access to institutional laptops/desktops, broadband/Wi-Fi, and the LM system. According to Jannat et al. (2021), only 54% of students have accessed institutional technologies. The study found that Students get much technological access from institutions though there are some limitations. Even though all of the ECs now have free Wi-Fi, only almost 66% of students have access to institutional technology. Furthermore, structured questionnaires revealed that all teachers stated that students have access to institutional, technical facilities such as desktop computers

and the internet. The institution, however, does not have an LM system. Finally, principals agreed that desktops are accessible and ECs require their LM system to expand the scope of the Flipped Classroom approach's implementation.

Internet Services: "Students are accustomed to various internet services such as social media (WhatsApp/Facebook/Messenger), Google Forms, YouTube, and Email services". 98.8% of students are aware of online services such as social media (WhatsApp/ Facebook/ Messenger), Google Forms, YouTube, and email. According to principals, students are also accustomed to using numerous internet services such as social media (WhatsApp /Facebook/ Messenger), Google Forms, YouTube, and email services. Furthermore, all teachers consider that all students have sufficient knowledge to use various online services such as Email, Facebook, and YouTube at this time. According to Fatema et al. (2020), 100% of Bangabandhu Sheikh Mujibur Rahman Science and Technology University respondents in Gopalganj, Bangladesh, use different internet services.

Perception

The second key issue is perception regarding the FC approach among the students of ECs.

Confident in using the internet: It is found that all of the students have confidence to use the internet as an aid to their study. It has been seen that 99.3% of students have confidence that they can use internet services to aid their studies. On the other hand, most of the teachers strongly commented that the corona pandemic teaches us to use the internet as an aid to study. Principals also agree that students have the potential to use the internet to enhance their learning. Also, one study reveals that more than 80% of students have confidence of using the internet (Fatema et al., 2020).

Familiarization with Blended/Flipped learning: Most of students have the idea about blended/flipped learning approach. The study shows that 66% of students have an idea about this approach. Also, according to Jannat et al. (2021), more than 70% of students of different public universities have an idea about Blended learning. Teachers also say that most students have an idea of the flipped classroom approach, but it is still new to them. Similarly, principals said that seminars or workshops are helpful to acquaint the students with this new teaching-learning approach.

Affordability in teaching practice

Affordability indicator of the FC approach finds the easiness of sustainable implementation of this approach in teaching practice. After analyzing the qualitative data from the structured questionnaire and KII, "*Basically, in our infrastructure, FC approach will be relatively affordable to implement in teaching-learning practice,*" statement has been found. Most of the teachers have been given a strong opinion that in the current infrastructure of ECs, this approach is affordable to implement because now ECs have enough technological support. In addition, all of the teachers also have their technologies. On the other hand, some teachers said that, though we have enough facilities to afford the FC approach, we need to strengthen the technological basement for the proper implantation of this approach. In line with this, KII also shows the positive perception that "*Due to technological advancements in both personally and institutionally, teachers can afford this FC approach in their teaching practice*." According to Jannat (2021), 60% of the teachers responded "yes" that they have enough infrastructural support. 30% of the teachers pointed out their lack of funding and responded negatively and the rest of the 10% kept no opinion.

Availability of Resources

The third key issue is the availability of resources for implementing the FC approach among the students of ECs.

Open Educational Resources: The study found positive results about the statement, "Numerous open educational resources are available." It has been seen that 95% of students have agreed that huge open educational resources (e.g., video, simulation, eBooks, and soft copies of lecture notes) are available in the internet. Husniyah (2018) also asserted that several open educational resources are available on the internet. In keeping with this, all teachers and principals stated that educational resources are currently available on the internet, and one teacher remarked, "Due to the free availability, open educational resources have become frequent platforms for students."

Available open educational resources can significantly enhance teaching capability. *The* internet has vast open educational resources (e.g., video, simulation, eBooks, soft copies of lecture notes), which facilitate the teaching and learning environment to a great extent (Faieza, 2020). Also, from the students' perspective, it shows that 95% of students agree that many different types of open educational resources are available on the internet. According to the results of the structured questionnaire and the KII, open educational resources are currently available on the internet. One teacher stated, "Open educational resources have become regular platforms in teaching practice due to their free availability."

I**nteractive Contents:** There are numerous interactive contents available. The study reveals that 80% of students agreed that interactive content is available on the internet. According to Husniyah (2018), engaging content makes studying more enjoyable. In keeping with this, most teachers and

principals agreed that interactive contents are currently available on the internet. One teacher remarked that "Students are increasingly using free interactive content as a learning platform."

The study found that available online interactive content can greatly enhance teaching capability for teachers in the technical subjects. Nowadays, different types of interactive content are available in online. These teaching learning contents facilitate the teaching capability. So, when the blended method has been used in teaching practice, teachers have to use online content, which enhances teaching capability and is an enjoyable way of teaching to engage the students in learning. Among total respondents, 56% use the internet for academic or educational purposes (Fatema et al., 2021).

Personal Technologies: According to Fatema et al. (2021), most of the respondents (68%) like to use the internet on smartphones because a smartphone is bearable and its functions are too easy to understand. The current era has ample technological facilities. Today it is impossible to sustain without using technology, even in personal life. So, definitely, the following argument has been found: "*Every instructor has their technology resources, which are required for the FC strategy to be implemented.*" In line with this, all respondent teachers and principals claimed that due to the availability of personal technology such as smartphones, laptops, and internet access, every teacher has their technical assistance to apply the FC method in teaching practice.

Institutional Technologies: ECs have enough technology resources required for the FC strategy to be implemented. From different studies, it has been found that the government of Bangladesh has taken necessary steps to raise funds for providing technological

facilities in every institution to facilitate the education system. In line with this, 100% of teachers and principals claimed that due to the availability of institutional technology such as desktop/laptops, multimedia classroom, document camera, and broadband/Wi-Fi facility, the FC approach demands its implementation to enhance the teaching-learning environment.

Opportunity

The fourth key concern is the opportunities the FC plan would provide students if implemented in ECs.

Better Learning Resources: It is found that learning resources are better when a variety of types (e.g., video, simulation, eBooks, and soft copy of lecture notes) are used. Almost 98% of students agreed that after implementing the FC approach, learning resources get better when a variety of types (e.g., video, simulation, eBooks, and soft copy of lecture notes) are used. In keeping with this, teachers and principals believe that the FC approach gives pupils more learning materials. In-depth knowledge is ensured by the FC technique, which mixes offline learning with online educational materials. Learning resources get better when an individual integrates online content, according to Faieza (2020).

Enhance Classroom Engagement: The statement is, "Enhanced Classroom engagement through online-based activity." 83.9% of students put a positive attitude that after implementing the FC approach, classroom engagement must be enhanced through online activity. Furthermore, all teachers and principals felt that employing internet technologies and the FC approach provides pupils with more classroom amenities. Because the FC method is a technology-assisted

teaching-learning method, after implementing this, classroom engagement will improve. Harrell and Harris (2006) and Young and Lewis (2008) discovered that teachers generally have positive feedback on blended learning in terms of overall satisfaction and enjoyment. Students' satisfaction was also found in the findings of this study.

Enhance Learning: Feng Su and Namrata Rao (2020) carried out a study on blended learning and said that the blended online pedagogy will combine face-to-face synchronous learning (such as Zoom, Google Classroom, Flipped Classroom etc.) with asynchronous learning to offer opportunities for cognitive participation, which allows students to process the learning and reflect on the learning. The study has found that online interactive content can greatly enhance learning in the technical subjects. Almost 85% of students agreed that the FC approach enhances learning, especially in technical subjects, due to its online interactive content. Also, teachers and principals agreed that the FC approach provides students with more excellent learning in technical subject using online tools. Because the FC approach is a technology-enabled teaching-learning approach, classroom engagement will be enhanced after implementing the FC strategy. One of the principals stated that "Because ECs offer engineering degrees, students have a better chance to improve their technical expertise through the FC approach."

Feeling Engaged: Students will feel more engaged in learning with Flipped classroom approach. 76.8% of students put a positive attitude to the statement that combining traditional and online learning will result in a better learning environment. As students were engaged in more varied situations and authentic materials, they found learning more enjoyable and interesting (Peacock, 1997). All teachers and principals agreed that the FC approach of teaching-learning provides

a better learning environment for the students and they will feel better engagement in learning.This environment is one of the main benefits of using the internet for the learning process since students can access materials, they find more enjoyable than the traditional classrooms could not provide. Students were also motivated because they could learn at their own pace, which they find difficult to do in traditional face-to-face classrooms. This system of learning is beneficial for low-level students. They can provide themselves more time to understand the materials and finish the homework at a more relaxed pace. Students were also more involved in the task as they needed to accomplish it individually.

Better Teaching: According to Jannat (2021), A question was put to the teachers that a blended learning system can develop the techno-skill of the students and create an opportunity for the students to continue part-time jobs or not. 90% of the teachers agreed that it would be beneficial for the students. The current study has found that teaching is better when a variety of online resources (e.g., video, simulation, eBooks, soft copy of lecture notes etc.) are used. Teachers can now restructure their classrooms and teach students in new ways. Blended learning combines in-person instruction and online technology that enables student-centred learning.

It has been observed that after using the FC strategy, 95.5% of students believed that teaching is improved when a variety of forms (e.g., video, simulation, eBooks, soft copy of lecture notes, etc.) are employed. In accordance with this, all teachers and principals believe that the FC approach provides a better teaching environment. Moreover, in-depth knowledge is ensured by the FC technique, which mixes offline learning with online educational materials. One of the principals stated “The FC technique ensures better teaching, and it is a globally known concept”.

Enhance Knowledge: According to Andaleeb (2017), digital needs to be the new reality in Bangladesh, and by incorporating technology into education, teachers may be significantly more creative.The experiences of blended learning pioneers show that by implementing such an innovative teaching program, one can radically improve teaching effectiveness and enhance knowledge. In line with this, the current study also found the statement "the FC approach must enhance the knowledge, especially in technical subjects."

In the FC approach, according to all of the teachers and principals, online resources give in-depth knowledge of technical topics. Also, 84% of students responded similarly that, since the FC method is technology-assisted teaching-learning method, it enhances technical knowledge. As a result, after implementing the FC method, classroom engagement will improve. "Because ECs offer engineering degrees, teachers have a better chance to increase their technical knowledge through the FC approach," one of the principals said.

Enhance Teacher Student Engagement: According to Faieza (2020), "as the advancement of technology has turned our world into a global village, it is possible for students to communicate with experts from other parts of the world and enhance their knowledge." In line with this, the current study also finds the statement "FC approach must enhance teacher-student engagement."

This study also reveals that the majority of teachers and principals agree that the FC approach facilitates teacher-student engagement. Also, 81% students give a similar response that the FC method is technology-assisted teaching-learning method that enhances the teacher-student engagement virtually.

FACILITIES REQUIRED TO IMPLEMENT FLIPPED CLASSROOM

The goal of this chapter is to identify the necessary facilities for the implementation of the FC approach in ECs using data collected from teachers, students, principals, and IT experts to recognize that the implementation of the FC learning model is a demand of time, especially in the aftermath of the Corona pandemic. This part also explores the benefits of this educational system.

Personal Facilities

Technological facilities can be divided into two types, such as personal technologies and institutional technologies. According to the literature, the National Council for Science and Technology, under the governance of the Ministry of Science and Technology, plans and develops national science and technology policies. Bangladesh was ranked 116th in the Global Innovation Index in 2019, 2020, and 2021. It can be claimed as "Every inhabitant of Bangladesh now has access to personal technologies such as laptop/desktop computers, smartphones, open educational resources, and free internet".

It has been revealed that about 99% of students have accessed their technologies. Based on the collected data, teachers, students, and principals from all ECs believe that personal technologies such as Laptop/Desktop computers, smartphones, OERs& Internet access are the prerequisites for the implementation of the FC approach. Moreover, it is desired that these types of technology are now available to every person in Bangladesh (Fatema et al., 2020).

Institutional Facilities

Without institutional technological facilities, it is impossible to implement the FC approach. The government of Bangladesh has taken necessary steps to raise funds so that all institutions have

ample technologies to support their teachers and students. Then the argument can be claimed as: "ECs now provide access to technologies such as laptop/desktop computers, smartphones, and free Broadband/ Wi-Fi." It has been found that only 68% of students have accessed their institutional technologies. Also, according to Jannat et al. (2021), only 54% of students have accessed institutional technologies. Gathered data from teachers, students, and principals of all of the ECs show that the ECs should provide easy access to laptops or desktops for both students and teachers. Second, free Wi-Fi access should be required throughout the institution. Moreover, it is to be desired that these technologies are now available to all ECs. After the corona pandemic, the growing availability of these technologies is astounding.

ECs must provide a learning management system to support the flipped classroom approach. A standard learning management system is the most important requirement for implementing the FC approach. The main advantage of using this platform is its simple design and user interface, followed by beautiful design and easy accessibility, despite the fact that this platform is similar to Google Classroom (GaroteJuradoet.al., 2013). 85% students agreed that the institutions should provide a common learning management system. Also, all of the teachers and principals agreed that a well-designed learning management system is the most important indicator to implement the FC approach appropriately. "A flexible LM system may assure enhanced and quality education," one of the teachers noted.

The study finds that ECs must provide free access to paid tools. Another important tool for the FC approach is paid tools. Institutions should take the necessary steps to free up these tools so that teacher and student can enhance their teaching-learning capability. Learning through technology demands reliable hardware, user-friendly software, a high bandwidth network along with proper knowledge and skills (Faieza, 2019). Paid tools or websites are highly vital, according

to the teachers and principals, because these websites provide much sophisticated information. Therefore, institutions should take steps to provide free access to these paid tools in order to increase advantage of the FC strategy.

Skills

Without the necessary skills, it is impossible to implement the FC approach in teaching practice and student learning. Communication, collaboration, adaptability, and empathy are needed abilities of the flipped classroom method in teaching practice. To transform the traditional face-to-face class into a technology-enabled flipped classroom, teachers' technological proficiency is one of the most important factors to justify the implementation of the FC approach. The importance of, and need for, continuing professional development for teachers with sufficient time for development should be acknowledged (Vaughan, 2007). From teachers' point of view, it has been revealed that Communication, collaboration, adaptability, and empathy are needed abilities of the flipped classroom method in teaching practice. Similarly, principals of ECs have the same thoughts that teachers must have the technical knowledge to drive online tools and hardware tools. "Teachers with technical skills can play an important role in motivating students to participate in learning through the FC approach," one principal remarked.

The study finds that communication, teamwork, and technical knowledge are required skills of flipped classroom method for students learning. Creating a culture of innovativeness automatically helps individuals be creative and provides a broader base for unique ideas in society (Faieza, 2019). This is not enough to establish an environment conducive to technological advancement. Nowadays, many seminars, workshops and conferences have been taken through

online tools. Due to the above reasons, learning is entirely dependent on technology. In addition, all teachers and principals emphasized that communication, teamwork, and technical knowledge are essential for the FC approach to student learning.

Hardware Facilities

From the country context, hardware facilities such as server and optical fibre connections for high-speed internet are necessary to implement the FC approach. Bangladesh has its server and optical fibre connection which is a preliminary element for the FC approach. Digital Bangladesh implies the broad use of computers. It embodies the modern philosophy of effective and useful use of technology to implement promises in education, health, job placement, and poverty reduction (ICE Business Report, January 2020). In line with this, Bangladesh now has its own technological facilities that offer the FC approach's easy implementation in teaching and learning.

To justify the current argument, FGD has been done among the IT experts to find the real picture of the current country context regarding technological advancement. "Bangladesh has its own server and optical fibre connection, which is a preliminary element for the FC approach, and which supports are available in Bangladesh," one IT expert remarked. Also, it has been seen that 91% of students have a positive response.Furthermore,all of the teachers and principals believe that hardware facilities in Bangladesh are now available at a satisfactory level to support the FC approach.

Software Facilities

Software technology is a general term covering the development methods, programming languages, and tools to support them that may be used in software development. Some common examples of

software include Microsoft Word, Adobe Photoshop, Adobe Reader, Google Chrome, Gmail, PowerPoint, VLC, and many other similar computer programs that we often use daily. Much software is now available online. Now in Bangladesh, there are enough IT experts available who can develop software. The study found that HTML, CSS, JAVAS CRIPT, PHP, LARAVEL, and Android & IOS-based apps are available in Bangladesh. To support the current argument, an FGD was conducted among IT specialists to determine the true picture of the current country's technological advancement situation. All IT experts stated that they have sufficient expertise to design their software and that many types of vital software are also available online for free. All of the teachers and principals likewise supported this argument. The software development industry of Bangladesh seems to be a promising destination for business process outsourcing (Rahim et. al., 2017).

Experts

An information technology expert works to monitor and manage computer hardware, software, and networks within an organization. This expert is known by a wide range of titles, including network administrator, information security analyst, business information technology analyst, and information technology project manager. Bangladesh has a large number of experts with sufficient technological knowledge. To support the statement, according to Zerina et al. (2008), it is clear that only 44% of professionals are Computer science graduates and 56% are from other education backgrounds. Bangladesh has focused on producing technology experts in tandem with the advancement of technology.

CHALLENGES TO IMPLEMENTING FC APPROACH

This chapter aims to identify the challenges to implementing the FC approach in ECs using data collected from teachers, students, and principals.

Technological Challenges

Despite Bangladesh's technical advancements, the majority of the population is unaware of blended learning. Many instructors, students, and other educated people are also unaware of how to use various web tools and integrate technology into education. One of the major obstacles to applying the FC approach in the context of ECs is a lack of technical understanding. 67% of students believe they will have difficulty using technology due to a lack of technical understanding. Furthermore, 16 percent of students stated they will have no difficulty using technology. Similarly, the majority of teachers and principals indicate that teachers may have difficulty using technology but that proper training will be able to overcome these deficiencies.

Another key obstacle that may obstruct the proper implementation of blended learning in Bangladesh's higher education institutions is some teachers' rigid mindsets and attitudes. Some teachers still believe that the traditional teaching method with chalk and board is the most effective way to teach kids and that all other new teaching aids are ineffective. The current research has discovered that some teachers and students still refuse to use technology in the classroom.

To effectively highlight students' unwillingness to adopt technology in the classroom, 79.3% of students believe that using online resources will involve more time and effort, impeding their learning. In this regard, EC teachers share the same viewpoint. Other teachers and students, on the other hand, believe that employing technology in education will result in improved time management.

Finally, the whole data, both primary and secondary, yields the following conclusion: Learning becomes more meaningful as blended learning provides students with a more dynamic learning experience and a high-quality education. More than 34% of students believe integrating technology into school will disrupt their regular learning methods. Again 43% of students said technology would not interfere with their normal studying approach. Similarly, teachers and 100% of principals agreed that incorporating technology will not detract from the traditional learning method. "While formal classroom settings offer a human touch to the educational process," one teacher observes, "online tools can help teachers achieve a high level of active involvement and greater flexibility in learning."

Almost 59% of students pointed out that they are concerned about getting enough technical support from the institutions because ECs have weak networking infrastructure and there are no IT experts. But 17% students responded that they can use technology without any help of experts, which shows a prominent result for implementing FC approach in ECs. Additionally, most of the teachers of ECs also have positive attitude that they are concerned about getting sufficient technical and financial support for the FC approach. One of the principals of ECs said that Even though ECs have several technical shortcomings, they nonetheless have a good chance of grasping the FC method.

Half of students strongly agree that using online resources in learning hurts the intern. Other students, on the other hand, have a neutral attitude. Similarly, instructors and principals have stated that excessive internet usage might impede learning and teaching. Adverse effects include internet addiction, loss of face-to-face communication, time-wasting, excessive use of social networking sites, and sadness, according to Fatima (2020). Finally, the study

suggests that because the internet is considered an inseparable element of human life, students should be aware of how they use it.

Pedagogical Challenges

Due to the advent of various educational technologies, such as Google Classroom, Moodle, Edmodo, and Schoology, today, educators are trying to utilize various online tools to replicate the physical classroom experience in a digital environment. However, a common misconception among most educators is the belief that they can teach any content using any form of technology. Such a flawed perception can result in poor planning and waste of valuable time and resources. Hence, before incorporating any new technology in education, it is crucial to consider its pedagogic and psychological effects.

Educators need to realize that technology alone cannot ensure productive and enriched learning as human elements are still needed in a technology-enhanced environment. Educators should develop blended learning programs in which one can match every type of content to the most appropriate medium of technology. Here, the process uses learning outcomes (LO) and assessment techniques (AT) to determine the best technological aids for specific content taught in the class using models such as Bloom's Digital Taxonomy of Learning for guidance. This process will ensure that students gain mastery of both lower-order level learning and higher-order level learning with the help of both self-paced technologies and collaborative technologies.

Teachers find it difficult to choose proper instruments, according to this study. According to qualitative research, 100% of teachers stated that, due to the introduction of various educational technologies such as Google Classroom, Moodle, Edmodo, and Schoology, educators are now attempting to mimic the physical classroom experience in a digital setting. Most educators, on the other hand, misperception that

they can teach any subject using any technology. A faulty perception can lead to poor planning and wasting time and money. As a result, assessing the pedagogic and psychological implications of every new technology before introducing it into school is critical. In addition, principals agreed with the above statement, and 98% of students felt that choosing the correct tools was difficult.

Due to the advent of new technologies and digital learning platforms, flipping the classroom has become easier and more effective. The study found that properly utilizing class time is difficult. 91% of student have agreed that properly utilizing class time is difficult. The majority of teachers and principals agreed with the remark, and one teacher stated that the instructor must first prepare a video of his or her lecture detailing the essential theories or topics that will be covered in the next session. The teacher will then post the video lecture as an assignment for the students on an online learning site. The students must watch the video lecture and complete a quick online exam based on the video lecture content. The test report from the online exam will tell the teacher which parts of the video lecture students had trouble understanding, and this knowledge will help the teacher plan more effectively for his or her next in-class lecture. As a result, the teacher can devote the majority of the face-to-face class time to those essential areas in which pupils require additional attention. Furthermore, by flipping the classroom, teachers can spend more time in class with their students, solving difficulties, answering questions from online lectures, and assisting students with group projects.

Administrative Challenges

Implementing blended learning at HEIs in Bangladesh requires full dedication from government authorities and university management

in Bangladesh. In order to make knowledge and education correspond with the present digital world, it is essential to increase the exposure of all parties – students, teachers, and administrators – to technology-supported learning tools. However, the study has found that most teachers and students in Bangladesh face various difficulties in using technology in the classroom, including slow internet connection, system crashes, and hardware problems.

According to the current study, the administration faces a hurdle in supervising online classes. The statement was agreed upon by 85% of students and the majority of the teachers provide the same response. Also, EC principals stated that supervising online classes is extremely difficult, adding that they have already experienced the corona pandemic.

According to the findings, the management faces a difficult task in continuously monitoring feedback from teachers and students. 75% of students and all of the instructors agreed with the statement, and one of the principals stated "it is difficult to monitor FC method input if teachers and students are not cooperative." According to Jannat et al. (2021), the FC approach's feedback is a critical component for fully exploiting the approach's potential.

CONCLUSION

Face-to-face interactions between teachers and students are possible in traditional classroom teaching, which aids synchronous communication. Teachers in traditional teaching settings can provide immediate feedback to their students on any question, while students are positively influenced by their teacher's personality, behavior, and value system. Virtual classrooms, on the other hand, allow students to learn from anyone, anywhere, at any time. Students in blended learning can always meet in virtual classrooms with their co-students

and teachers, regardless of geographical barriers. They can learn and share their knowledge without fear of being mocked.

Based on the preceding discussion, it can be stated that implementing the flipped classroom concept for improving educational quality is in high demand.

Students in ECs benefit directly from this Flipped Classroom strategy. It is impossible to provide facilities to everyone in the traditional teaching-learning system due to institutional capacity constraints. As a result, the suggested approach will enable students to enroll in blended courses, which will then be assessed by qualified teachers. Teachers from ECs benefit directly from the Flipped Classroom strategy as well. Improved teaching capability, increased knowledge, and improved course content can all be incorporated directly into their teaching mechanism as a result of this approach. As a result, the proposed model will provide the opportunity to teach in a blended mode and so acquire expertise. It is possible to conclude that the Flipped Classroom approach has the necessary capability to play an important role in developing the educational environment of ECs.

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5

ONLINE TEACHING-LEARNING PRACTICES AT GRAPHIC ARTS INSTITUTES: STATUS, CHALLENGES, AND WAY FORWARD

Mst. Ayesha Siddika
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INTRODUCTION

An online teaching-learning practice is essential for developing skills in online platforms. Online teaching-learning practices can help students learn things visually, because of this, they can easily remember things using digital content. Teachers are also practicing and developing their IT skills in digital learning. Online teaching-learning practices at Graphic Arts Institute will help them to learn something new and gain knowledge. It is the key to the overall development of communication with teaching material among the students, teachers, and government policymakers.

Online academic education has been widely introduced during the Covid-19 period in Bangladesh. Like most other institutes, the Graphic Arts Institrute also had to switch to the online platform to complete the syllabus. Online teaching-learning practices are introduced for the pandemic situation at Graphic Arts Institute.

With the increased availability of the internet, students can access information anytime and anyplace that would normally be available only through traditional teaching-learning practices room. Technical issues are bound to happen in an online-only environment, some students being left behind, distraction and time management, the online platform goes to the loss of many social aspects with the online route, understanding course inspection, and lack of in-person interaction. There are various solutions to skills in IT learning sectors for developing online teaching-learning practices (Stern, 2018). Online distance learning meets the needs of an ever-growing population of students who cannot or prefer not to participate in traditional classroom settings. These learners include those unable to attend additional classes and live in remote locations.

For online teaching-learning practices, students and teachers are separated geographically, so face-to-face communication is absent. Still, in the evaluation and teaching field, these online teaching-learning practices have already encountered some unintended situations without internet access. So, it has been observed that they have difficulty adapting appropriately to this trend. We are conducting online teaching-learning practices, but it is unknown to us the effectiveness of the e-platform. To develop these situations, GAI has taken initiatives to improve students' and teachers' online teaching-learning practices.

Our instructional objective is to improve the user-friendliness of an innovative, inspiring e-Learning environment in which students will acquire skills, hence maximizing their opportunity to acquire knowledge during the learning process. According to the instructional objective, no research-based documents were found for the TVET sector to know the effectiveness of online teaching-learning practices.

The objectives of the study are to (a) get the present status of online teaching-learning practices at Graphic Arts Institute; (b)

identify the challenges of students and teachers of online teaching-learning practices at Graphic Arts Institute; and (c) determine the way forwards to overcome the challenges.

The study was conducted using a descriptive survey design. A Google form was used to collect data from 296 GAI participants, and a questionnaire was also distributed offline. Several focus groups and key informant interviews were carried out for the study for qualitative information.

Rest of the paper is organized as follows. Section two explores literature on online teaching-learning practices. Section three describes the state of online teaching-learning practices at Graphic Arts Institutes. The analysis of challenges and way forwards to overcome the challenges are presented in section four. Section five concludes with recommendations.

ONLINE TEACHING-LEARNING PRACTICES: EXPLORATION OF LITERATURE

E-learning tools for online teaching-learning practices have played a crucial role during this pandemic, helping schools and universities facilitate student learning during the closure of universities and schools (Doucet, et al., 2020). While adapting to the new changes, staff and student readiness needs to be gauged and supported accordingly. The learners with a fixed mindset find it challenging to adapt and adjust, whereas those with a growth mindset quickly adapt to a new learning environment. There is no one-size-fits-all pedagogy for online learning. There are a variety of subjects with varying needs. Different subjects and age groups require different approaches to online learning (Doucet, et al., 2020). Online learning also allows physically challenged students more freedom to participate in learning in the virtual environment, requiring limited movement (Doucet, et al., 2020).

The flipped teaching-learning practices room is a simple strategy for providing learning resources such as articles, pre-recorded videos, and YouTube links before the teaching-learning practices. The online teaching-learning practices classroom time is then used to deepen students' understanding through faculty and peer discussions (Doucet, et al., 2020). This is a very effective way of encouraging problem-solving, critical thinking and self-directed learning skills. virtual teaching-learning room platforms, such as video conferencing and adaptable cloud-based learning management systems, such as Elias, Moodle, Big Blue Button, and Skype, are gaining popularity.

Broadly identified challenges with e-learning are accessibility, affordability, flexibility, learning pedagogy, lifelong learning, and educational policy. Many countries have substantial issues with a reliable Internet connection and access to digital devices. While economically disadvantaged students in many developing nations cannot afford online learning gadgets, online education poses a risk of increased screen time exposure for the learner. Therefore, it has become essential for students to engage in offline activities and self-exploratory learning. Lack of parental guidance, especially for young learners, is another challenge, as parents are working. There are practical issues around physical workspaces conducive to different ways of learning.

The motivated learners are relatively unaffected in their learning as they need minimum supervision and guidance, while the vulnerable groups consisting of students who are weak in learning face difficulties. Some academically competent learners from economically disadvantaged backgrounds cannot access and afford online learning.

The level of academic performance of the students is likely to drop for the teaching-learning practices held for both year-end examination and internal examination due to reduced contact hours

for learners and lack of consultation with teachers when facing difficulties in learning/understanding (Sintema, 2020).

Student assessments are carried out online, with a lot of trial and error, uncertainty, and confusion among the teachers, students, and parents. The approach adopted to conduct online examinations varies on the convenience and expertise among the educators and the compatibility of the learners. Due to the large number of student population, many schools and institutions have not implemented appropriate methods to detect plagiarism. The countrywide lockdown and COVID-19 epidemic have resulted in the postponement of internal assessment, state-level board exams, recruiting exams, and university-level exams across the nation. Various entrance examinations have also been postponed/rescheduled. The education system in schools, colleges, and universities across the country has been severely impacted due to the ongoing situation.

It is also possible that some students' careers might benefit from the interruptions. School time also raises social skills and awareness, besides being fun for the children. There are economic, social, and psychological repercussions on the life of students while they are away from the normal schedule of school. Many of these students have now taken online teaching-learning practices, spending additional time on virtual platforms, which have left children vulnerable to online exploitation. Increased and unstructured time spent on online learning has exposed children to potentially harmful and violent content and greater risk of cyberbullying. School closures and strict containment measures mean more families have been relying on technology and digital solutions to keep children engaged in learning, entertained, and connected to the outside world. However, not all children have the necessary knowledge, skills, and resources to keep themselves safe online.

Majority of students do not have access to smartphones or TV at home, in addition to weak Internet connectivity. A huge population has no or less income due to the closure of businesses and offices. Online face-to-face teaching-learning practices (video) are encouraged by most; however, some students (economically disadvantaged) have expressed that the face-to-face (F2F) online teaching-learning practices consume more data packages. The teachers are in a dilemma as to whom to listen to and which tools to adopt. Some think pre-recorded videos could help; however, this would restrict interactions. It is difficult to design a proper system to fit all students' learning needs and convenience.

THE STATE OF ONLINE TEACHING-LEARNING PRACTICES

During the COVID-19 situation, the Graphic Arts Institute had to switch to the online platform to complete the syllabus. We have seen students mostly from the rural area and also from the urban area connecting to their teachers via internet to receive academic purposes with the help of verity of learning materials; as a result, we have identified several objectives that must be prioritized in order to effectively operate the teaching-learning practices at GAI. The study reports that during the online teaching-learning activities at GAI, almost all the students attended the online class for academic purposes.

In terms of the Status of students attendance in online classes per week, it was found that the maximum number of students attended all the classes conducted by the teachers. However, parallally, it was found that about 55% of the students have responded to attend more or less than five classes.

The study demonstrates that teachers took online class each week. About 50% of teachers conducted more than five classes, and it was also found that about 30% of the teachers had conducted more

than ten classes a week, and on the other hand, 20% of the teachers have conducted less than five classes a week.

In terms of the performance status of students when teachers have taken the teaching, the timeline of students attending online classes is observed. Half of the students responded to be present the full time (40 minutes as the classes were taken in zoom.us) of the class and on the other hand rest of them responded not to be present more than 30 minutes or even less than 15 minutes.

The majority of teachers and half of the students were from urban areas, while the remaining pupils were from rural areas. In addition to the student responses evident here in the FGD discussions, teachers have mentioned that the majority of students would come from rural areas and hence have a greater technical challenge.

The study shows that the percentage of students joining the class was unsatisfactory. It was found that about 50% of students join and continue their learning activities through online classes. Rest of 50% were not connected with teachers as well as with the institute.

The study found that the satisfaction was obtained, but it is just a slightly more than enough. This Status was noticed in the majority of the students whereas, the other 20% are satisfied, and the rest are not satisfied.

The study shows that providing learning materials in online classes such as PPT files, notes, project files, job sheets, etc. are introduced during academic activities. According to data, most students are satisfied with getting materials.

The study presents the status of completing the syllabus in time. It was found that 54% of the total respondents agreed syllabus was completed in due time. But the second largest, about 44%, were not agreed on the same. More students were able to complete the syllabus in time. Accordingly, it was found that the academic results of 2/3 of

the students have improved. At the same time, the result of 1/3 of the students has not improved as per their expectation.

Most of the students were engaged in extra curriculum activities such as quizzes, debates, Programming contests, etc. But it was found that more than half of the students were not engaged in any extra curriculum activity that may help their online learning practices.

THE CHALLENGES OF ONLINE TEACHING-LEARNING PRACTICES

There are some activities to continue at GAI from COVID-19 situations. Some issues and limitations were raised to maintain the situation. This section presents those challenges and the following chapter discuss the way forward to overcome the challenges.

Adaptability for a new purpose

Students' capacity to be modified for a new purpose is presented through this study. Most of the students' understanding of the new purposes of teaching-learning practices at GAI was not identified. There are limitations on adapting to the classes, such as using smart devices, technical difficulties, the absence of suitable conditions, etc.

Lack of attentiveness

Most of the teachers agreed upon the importance of direct students' teachers interaction in a class. Although 35% of the teachers entirely rejected this view. The majority of the teachers think that most of the students are slightly attentive in online classes. This status indicates that almost all teachers were somehow satisfied with the current online classes.

Students Distraction

The study reveals that the majority of students were unaware of distractions and stated they had not experienced any. But a few

students opined that some things were interrupted to continue the class such as social media, family problems, network problems, and teachers attention.

Technical support

The analysis reveals that the institute provides slightly sufficient technical support for teachers. About 70 of students among the 135 respondents said their technical support is getting poor. Their guardians and institute did not provide any support about the technical issues. But 65 of students among the 135 respondents showed positive remarks.

Time management

The time management of teachers was no issue for 23% of the students. But the other 12% agreed to increase the class time and reschedule the time management; the rest had not put any opinion forward.

Practical learning

Among 276 students, only 65 students responded that they were not concerned about the satisfaction of practical learning.

Learning evaluation

Teachers and students agreed that online teaching-learning techniques promote classroom attentiveness during examinations and other evaluation processes. But a few students had put forward the demand for a better evaluation process. However, most of the students were absent to take their opinion. The FGD questionnaire for parents revealed that evaluation is a superior method for gaining students' attention.

CONCLUSION

Technical support is necessary for improving the online teaching-learning practices at GAI. To develop technical difficulties, according to the FGD discussions, we observed that students need logistics and digital equipment for classes effectively and faithfully. In addition, the majority of instructors believed that teaching and learning should be sufficiently updated and that teachers should be provided with instruments. Respondents agreed that online teaching-learning practices had improved their technical skills. According to FGD discussions for students, we observed that offline training is necessary for online teaching-learning practices. Most teachers agreed that technical and digital content training are highly necessary.

50% of students appreciated online learning. But half percents of students are concerned that awareness and effectiveness should be increased for all students. Developing communication gap among teachers, students, and parents needs more motivation according to the FGD data analysis.

It was noticed that about 60% of students demand a requirement for extra classes in order to receive more learning materials. Thus, by this, they want to get more satisfactory online learning.

Most students and teachers agreed that the Communication gap is highly faced. From the FGD discussions, teachers observed that most parents were not acquainted with the online classes and thus are not communicating enough. They had several observations to develop communication, such as continuing class online during holidays and communicating via SMS during online parent-teacher meetings.

It was discovered that communication between teachers and parents was inadequate. More than 50% of students have mentioned their teachers not to be communicating with their parents enough.

Thus, they suggested receiving feedback through email and instructing teachers to communicate with them periodically.

A majority of the teachers highly appreciated that trainings for taking classes would be a lot more helpful. Though on the other hand few of them showed satisfaction still trainings such digital content training, technical training, usage of smartphone training, department wise training etc were asked to be looked forward by many.

Following are the recommendations to facilitate online teaching and learning:

- A teaching environment should be developed of online classes for students and teachers that can be effective and attractive in digital contexts.
- The teaching Environment encompasses learning resources and technology, connections to global teaching-learning practices, and modes of learning.
- In order to get participatory class with students and teachers and complete syllabus, class time & number of classes should be maximized as per requirement.
- Online classes & evaluation system needs monitoring to obtain quality education.
- Extra curriculum activities should be ensured to avoid distraction.
- Teachers need training for the quality online teaching-learning system.
- In addition to introducing the instruments and online class monitoring, the higher authority should start on a Learning management system (LMS) journey for the online teaching-learning system.
- Financial support is required (for Smartphone, Mobile data) for some students in rural areas.

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PART II

TVET QUALITY AND EMPLOYABILITY

6

SKILLS DEVELOPMENT AND EFFECTIVENESS OF INDUSTRIAL ATTACHMENT OF POLYTECHNIC GRADUATES IN BARISHAL DISTRICT

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INTRODUCTION

When training providers and industries collaborate to provide contextual learning opportunities in the workplace, learners and Technical and Vocational Education and Training (TVET) practitioners access authentic experiences. Students must adapt to their new professional environment by putting their theoretical knowledge into practice in the real world of work. In most cases, polytechnic graduates put their talents and theoretical technical knowledge to practice in their first jobs after graduation. Students can be assisted in better implementing their concepts in the workplace by integrating conceptual knowledge and training through industrial attachment programs (Anjum, 2020).

The attachment programs not only help students improve their talents but also help them polish their professional development and experience. Modern polytechnic institutes, students, and industry recruiters understand the value of industrial attachment programs, and they encourage students to participate in such programs. Industrial attachment programs allow polytechnic institutes to upgrade their skill while preparing their curriculum. Industrial attachment is a chance for students to gain hands-on work experience. Industrial attachments too provide employers with valuable employees and qualified job applicants.

According to Ronnestad and Skovholt (1993), the usefulness of knowledge depends on what students already know and how they correlate their understanding with the problems they encounter in the workplace. Raskin (1994) demonstrated that there is a significant disconnect between classroom knowledge and practical practice. Students, academic faculty, and staff devote minimal effort to maximising the benefits of industrial training programs. Sometimes, students observe the industrial training workplace environment without applying their academic knowledge to the challenges they face there, and sometimes, academic advisors or teachers do not better equip their students to take full advantage of the industrial training opportunities (Frantzich, 1986).

Furthermore, industrial training assists polytechnic students in developing positive personal qualities and professional habits, as well as a significant increase in their level of confidence. Students participating in industrial attachment programs are more likely to receive high-quality employment offers .

Employers occasionally keep a watch on their interns to pick them as potential future employees. Companies can save money on hiring and training costs with this practice. Interns work with businesses to provide part-time assistance, innovative ideas, and exchange various

types of knowledge. In contrast, the disadvantages of industrial attachment for organizations are that they must provide extensive guidance and support to interns throughout their time with them, as well as training and feedback at each stage of their employment.

Industrial attachment programs assist polytechnic institutions in building their reputation by strengthening their ties with the business world, increasing the availability of research grants, receiving positive feedback from corporations on their curriculum, and increasing the number of job opportunities for their students (Edziwa & Chivheya, 2013).

A growing number of technical and vocational education and training (TVET) institutions conclude that industrial attachment programs are a great source of career and professional preparation for students. They give students hands-on work experience in a professional setting. On the other side, they make it simple for employers to choose job applicants who are adaptable, experienced, and highly competent in their fields. In this way, industrial attachment programs benefit students, polytechnic institutes, and businesses, and they should be encouraged. This is an era of technological advancement, expansion, and innovation. As a result, it is vital to develop in pupils the skills and talents that will enable them to cope with the demands of the modern workplace. To develop these skills and talents, the TVET educational system in Bangladesh must be improved by enhancing teaching techniques and curriculum development, involving more research, and offering practical training to students.

The primary goal of this research is to investigate the effectiveness of attachment programs for polytechnic graduates in future professional life (future workplace), career progression (the process of advancing to better positions), and self-improvement (skills development). This study also aims to identify the challenges and

solutions for the present industrial attachment programs for diploma engineering students in Bangladesh. This research will provide valuable recommendations to industries, polytechnic institutes, and students relating to the progress of work placement programs to improve the skills and abilities, career progression, leadership ability, and work-related experience of Bangladesh's TVET students.

EFFECTIVENESS OF INDUSTRIAL ATTACHMENT

In this research, five polytechnic institutes from the Barishal district were selected, four private and one public. In the research population, the private polytechnic Institute has 565 (36%) students and the government polytechnic has 1026 (64%) students. The results show that among 150 respondents, 145 (97%) were male and 3% were female. There were 94 (63%) students from Government polytechnic institutes and 56 (37%) from private polytechnic institutes. Among the students, 39 (26%) were from Civil Technology, 38 (25%) from Electrical Technology, 29 (20%) from Electronics Technology, 14 (9%) from Mechanical Technology, 13 (9%) from Power Technology, 9 (6%) from Electro-medical Technology and 8 (5%) from Computer Technology.

The results depict that most students did their attachment program in the training centers. There were 81 (54%) students who went to Training Institutes, 33 (22%) students went to Industry, 19 (13%) went to business organizations, 9 (6%) students went to Government organizations, and 8 (5%) students went to service center.

Regarding training days per week, about 62 (41%) students did their training for three days, 47 (32%) students for six days, 36 (24%) students for five days, and a small portion is 5 (3%) students did their training for less than three days per week.

Measurement of central tendencies

The study results illustrate the central tendencies of the responses to the questionnaire from 150 study participants. The highest mean and standard deviation (SD) for professional development (PD) are 4.68 and 0.81, respectively. The lowest mean and SD for PD are 4.27 and 0.52, respectively. The range of mean from 4.27 to 4.68 depicts that most students agree that industrial training is effective for personal development. The lowest means and SD for professional skills (PS) are 3.39 and 0.99, and the highest mean and SD are 4.30 and 1.38, respectively. The mean range of 3.39 to 4.30 shows positive responses from students for all the items of PS. The lowest and highest means for personal capabilities (PC) are 2.73 and 4.53, while the lowest SD and highest SD are 0.58 and 1.13, respectively. The mean range of 2.73 to 4.53 shows students' positive responses for all the items of PC.

Scale measurement

This section elaborates normality and reliability of test results, evaluated to check the normality of the distribution of the study data and the reliability of the questionnaire.

The acceptable skewness range is ±3, with an acceptable kurtosis range of ±10 (Kline, 1998). The data of the study will be normally distributed if values of kurtosis and skewness fall within this range. The study shows the results. These results show that critical values of kurtosis of PD range from −0.06447 (PD1) to 0.83902 (PD3), whereas critical values of skewness of PD range from −0.84746 (PD1) to 1.34042 (PD3). The results indicate that all the values of kurtosis and skewness of personal development fall within the acceptable range; therefore, the data on personal development is normally distributed.

It is also seen that the critical values of kurtosis of PS range from −0.65253 (PS3) to 1.20450 (PS1), whereas the critical values of skewness of PS range from −0.07155 (PS2) to -1.46272 (PS1). The results

indicate that all the values of kurtosis and skewness of professional skills fall in the acceptable range; therefore, the data on professional skills are normally distributed.

However, the critical values of kurtosis of PC range from −0.65738 (PC1) to 7.36361 (PC3), whereas the critical values of skewness of PC range from −0.63546 (PC1) to -2.05670 (PC4). The results indicate that all the values of kurtosis and skewness of personal capabilities fall in the acceptable range; therefore, the data on personal capabilities are normally distributed.

At present industrial training is 12 weeks in Industry/ organization and then 04 weeks in Institute. So, if any student gets a job after 12 weeks, it is difficult to leave a job for 04 weeks. For this Industrial training, a complete semester will be spent in the industry, and it will be in the final semester. After completing the industry part, students will not attend any part of the Institute. As a government organization, it is difficult to maintain a training schedule for those who do not want to serve in this industrial training program.

The honorarium of Industry is now BDT 300 & raw materials cost is BDT 300 for each student. It should be a minimum of BDT 3000 for honorarium & BDT 1000 for raw materials. There is no training cell for training. Industry or government organizations do not want to serve this Industrial training program during training time. If government policy forces them to serve them, a training program will be more effective. Every organization or industry will have a training cell & training staff according to their total staff ratio. Training allowance for each student will be BDT 16000 per month, a basic salary for a polytechnic graduate who got a job in the government sector. At present, there is no training allowance for a student in a private polytechnic institute. All students of private polytechnics will have the same training allowance as those of government polytechnic institutes. Students are attached to different organizations in

different places. So, teachers who supervise and visit students will get an allowance for their visits. Students are facing problems with accommodation and food; especially female students are facing problems more.

There is no facility for disabled students. The industry does not provide extra facilities for disabled and female students.

All students agree that industrial training plays a significant role in developing personal skills, while the least number of students reported no improvement in professional skills. It can be seen that about 47% of students reported that industrial training increased their professional skills by more than 80%, while 30% of students reported that their skills increased by 80%. There is no doubt that industrial training helps a student improve their skills. In addition to the benefits, there are some challenges associated with the industrial training program in Bangladesh. Based on the questionnaire, FGD, and KII data following major challenges have been identified:

- In the existing industrial training system, after 12 weeks of a training program in the industry, students come back to the institutes for 04 weeks to complete their academic program. During their training, most of the students get a job offer based on their performance. Nevertheless, they lose their job as they need to leave the industry and come to institutes.
- In most of the industry, there is no special arrangement for female and disabled students.
- The training allowances for the industry are not satisfactory.
- It is hard for the teachers to visit the industry and students during the training in different places as there are no allowances for their visit.
- Most industries have no separate training cell for attachment training, which creates a problem for their regular working

environment during the training period. That is why most industries are not interested in taking students for training.

- There are no training modules or guidelines from the technical education board for industrial training.

CONCLUSION

The purpose of this research is to analyze the effect that participating in industrial training programs has on personal and professional development and the skill sets of TVET students. According to the findings of the central tendency measurement, all of the items on the questionnaire were met with positive responses from the participants surveyed. According to the findings of the normality test, critical kurtosis levels can vary anywhere from -1.68213 to 7.36361, while critical skewness values can range anywhere from -2.05670 to 1.31037. The critical kurtosis and skewness values fall within the acceptable range, indicating that the data from the study are normally distributed.

According to the findings, industrial training programs affect the personal development, skills, and capabilities of TVET students in Bangladesh. This program has a direct bearing on the 'students' professional development and advancement.

Based on the findings of this research and feedback from teachers and industry personnel following recommendations are made:

- Industrial training can either be for 1 full semester or pushed to the 12 weeks of attachment to the end last of the semester so that students are not needed to return to the Institute and can continue their job.
- The honorarium for both students and industries needs to be increased.
- Teachers should be paid for their visits to the industry and

students so that students get motivated and work at a full pace.

- The Government should make a policy at the inter-ministry level for the industries to make a separate training cell in every industry and make it mandatory for them to take the students for training.
- Even though the number of female and disabled students is low, every industry must have a facility for female and disabled students so that they are motivated for TVET education and play a significant role in the development of the nations.
- The technical education board can prepare training modules or guidelines for industrial training.

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7

CHALLENGES IN PRODUCING COMPETENT GRADUATES IN GOVERNMENT POLYTECHNIC INSTITUTES OF SYLHET DIVISION

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INTRODUCTION

Technical and Vocational Education and Training (TVET) is the most important education and training processes to provide skill and technical employees for development. There are 10,682 public and private TVET institutions in Bangladesh. TVET is understood as comprising education and skills development of occupational fields and livelihoods. In Bangladesh, diploma engineers play a crucial role in the line of development. A diploma degree provides knowledge and skills for every developing sector. TVET is an essential tool for sustainable development and social inclusion of all segments of society. TVET provides education and training for the academic student and the youths leaving the academic stream of education.

Through various interventions and initiatives employed by the government of Bangladesh and other institutions to enhance

youth skills, the expected outcomes did not appear. Evidently, more than two million young people enter the labor force every year in Bangladesh, yet the youth unemployment rate has increased over the previous 25 years, from 4% in 1991 to 10.4% in 2016 (BBS, 2017). A low level of education and skills has been identified as the prime contributor behind low productivity in most sectors of Bangladesh, including the informal ones (Titumir & Hossain, 2003). One of the keys to a productive and competitive economy is a well-trained and adaptable workforce, as noted by the International Labor Organization (ILO, 1999).

Students in Bangladesh are supposed to be admitted for technical and vocational education and training (TVET) at the secondary education level. The scope for such education was very limited in the past, which has started to expand recently, with females lagging behind males. The share of TVET students in the Secondary School Certificate (SSC) examination was the lowest among various streams of education over time. Whereas the number of SSC examinees doubled during 2000-2018, technical and vocational education increased eight times in this time duration. The Education Watch study of 2016 shows that only 6.5% of the population with at least nine years of schooling received Technical and Vocational Education, with a significantly less proportion of girls attending those (Nath& Chowdhury, 2016). Over a quarter of them had no idea about the scope of studying TVET at the secondary level. These findings clearly show that TVET, as a stream of education, did not get a mentionable priority among the youth and the broader community as the other streams of education.

There are several TVET institutions in Bangladesh. Polytechnics, technical schools and colleges, youth development training academies, different training institutes, and many others administered by different ministries are included in TVET

institutions. Among them, polytechnic institute, which produces diploma graduates, plays a very important role in the technical industry in Bangladesh. We consider four government polytechnics in the Sylhet division as our targeted population.

The main focus of this research is institutional and curriculum-based challenges. For that, we have set two aims for this research. First, to identify the challenges that polytechnic graduates are facing in acquiring competency, and second, to determine the gap between industry demand for graduate competency and polytechnic curricula.

This chapter is organized into three sections. Section two describes curriculum and course materials-based challenges to produce competent diploma graduates. Section three describes various institutional challenges of polytechnic institutions in supplying competent diploma graduates. The last section summarizes all four challenges to producing competent diploma graduates, identifies gaps between diploma graduate competency and industrial demand, and formulates policy suggestions.

CURRICULUM AND COURSE MATERIALS

The course material in the diploma in engineering program is organized according to different technologies. The courses of each technology can be divided into two categories, technical subjects and related subjects. The total credit points allocated for the Diploma in Engineering are generally anticipated to be 150-160. About 10-15% for social skills, 15-17% for science and mathematics, 10-12% for related engineering, and 58-60% for core engineering subjects are allocated for each technology. The learning hour ratio for theory and practical is 40:60. Students spend 16 working weeks per semester and 30-40 class hours per working week. Class duration for all theory class is 50 minutes and practical class is 150 minutes. The final semester, is allocated for industrial attachment.

The students are assessed through a mid-term exam, class test, quiz test, assignment, presentation, and final exam for the theory part. For the practical part, students are assessed through practical experiments, report writing, and viva voce.

It is revealed that for Civil Technology, about 35% of students agree with the statement that theory part of the curriculum burdens the study, whereas, only 2% disagree with the statement. However, almost 24% of total students strongly agree with the question. So, the study can say that the theory part burdens the total syllabus of Civil Technology. According to the response of Computer Technology, more than 60% of students agree that the theory part of the curriculum burdens the study. However, near 15% of total students strongly disagree with the question. It highly appears that the theory part burdens the curriculum for Computer Technology.In Electrical Technology, it is found that slightly more than 42% of students did agree. In this discipline, more than 27% of total students strongly disagree, which is almost double that of slightly disagreeing students. The result shows that for Electrical technology, the situation is almost the same as CT and CMT. According to the Mechanical Technology student responses, most students (43%) agree that the theory part of the curriculum burdens the study, which is around 4% more than those who strongly agreed. Hence the theory part burdens the entire curriculum for Mechanical Technology.

The result for the statement that "the present curriculum is relevant to the latest technology" separately for four technologies. For Civil Technology, 35% of students agree that the present curriculum is relevant to the latest technology, whereas 31% of total students' response slightly agrees with the question. The result summarizes that the curriculum of Civil Technology is relevant to the latest technology as per student response. According to the response of Computer Technology, it is evident that 45% of students agree about

the relevance of the present curriculum with the latest technology, which is three times that of strongly agreed with students. In addition, more than 29% of the total students' responses slightly agree with the question. The result is the same as CT The curriculum of Computer Technology is also relevant to the latest technology as per students' responses. For Electrical Technology, 42% of students agree that the present curriculum is relevant to the latest technology. Almost 24% of total students responded strongly agreed and 14% of total students slightly agreed with the question response. The students of Electrical Technology think that their curriculum is relevant to the latest technology. In Mechanical technology, 47.06% of students agree that the existing curriculum is relevant to the latest technology. Around 34% of total student's responses strongly agree. It can be said that students of Mechanical Technology think that their curriculum is also relevant to the latest technology.

The result for the statement that ''Curriculum is not capable of meeting the industry demand'' in different technologies disciplines separately. For Civil Technology, more than 27% of students agree that the present curriculum is not capable of meeting the industry demand, whereas, 18% of total students' responses slightly agree with the question. However, 20% of the total students' responses strongly disagree with the question. These statistics show for Civil Technology that the present curriculum is not capable of meeting the industry demand.For Computer Technology, 51% of students agree that the present curriculum is not capable of meeting the industry demand, whereas 15% of total students' response disagrees with the question. According to Computer Technology student feedback, the present curriculum is not capable of meeting industry demand. According to the response of Electrical Technology, more than36% of students agree that the present curriculum is not capable of meeting the industry demand, whereas almost 26% of total students strongly disagree with

the question. In Electrical Technology, the result is the same as the previous two. The syllabus is not capable of meeting present industry demand. In Mechanical Technology, more than 35% of students agree that the present curriculum is not capable of meeting the industry demand, whereas 22% of total students responded strongly disagrees with the question. The result shows the same situation for Mechanical Technology. The existing curriculum is not capable of meeting industry demand. From the four technologies listed above, it demonstrates that, according to student opinion, the present curriculum does not match industrial demand. The curriculum must be simultaneously revised.

For statement 4 Curriculum will not entitle you to gain a future career, 31% of students of Civil Technology disagree that the present curriculum will not entitle them to gain a future career, which is double that of strongly disagree, while only 25% of students agree with the question. More than half of the students of Civil Technology do not think their curriculum will entitle them to their future careers. According to Computer Technology, 30% of students agree that the present curriculum will not entitle them to gain a future career, whereas, 27% of total students disagree with the question. For Computer Technology, it is shown that maximum students agree that their technology curriculum will not be entitled to gain a future career. In Electrical Technology, 30% of students agree that the present curriculum will not entitle them to gain a future career, whereas, 27% of total students disagree with the question. Nevertheless, only 18% of students strongly agree that the existing curriculum will not entitle them to gain a future career. So, the curriculum of Electrical Technology will not entitle to gain future jobs for the students.The responses of the students of Mechanical Technology show that 37% of students agree that the present curriculum will not entitle them to gain a future career in Mechanical Technology. But a similar

percentage of students (around 17%) responded strongly agree and strongly disagree. The result is almost the same as the other three technologies. The present curriculum of Mechanical Technology will not confirm a student to gain a job in the future.

According to the response on 'Curriculum and lab instrument commensurate' for Civil Technology, 40% of students agree that the present curriculum and lab instruments are commensurate. Conversely, 24% of all responses from students disagree with the question. So, it can be said that the present curriculum and lab instruments are almost consistent with Civil Technology. In Computer Technology, 48% of students agree that the present curriculum and lab instruments are commensurate. Whereas almost 23% of total students responded slightly agreed with the question. Few portions of students (10%) strongly agree with that question. The result shows that the present curriculum and lab instrument are compatible with Computer Technology. Around 38% of students of Electrical Technology agree that the present curriculum and lab instruments are commensurate and 20% of students strongly agree with the question. Whereas 15% of total students responded slightly agreed with the question. Few portions, only 11% of students disagreed with the question. These statistics show that, as per Electrical Technology student's opinion, the present curriculum and lab instruments are commensurate. More than half (52%) of Mechanical technology students, agree that the present curriculum and lab instruments are commensurate. Whereas more than 13.43% of all responding students disagree with the question. For Mechanical Technology, it is shown that the present curriculum is compatible with lab instruments.

This study demonstrates the six kinds of responses by the students of all technology of three polytechnics. 47% of students think the theory part of the curriculum burdens their study. Only 1% of students disagree with this statement. For four technologies

of diploma, it is clear that the theory part of the syllabus burdens the students' study. Students prefer practical classes to theory. They can concentrate more in practical class than theory part. Either the authority should decrease the theory part, or they should make the theory more attractive to the students.

The study shows the data about the question "present curriculum is relevant to the latest technology." The study demonstrates the six kinds of responses to question 2 by the students. 43% of students agree that the present curriculum is relevant to the latest technology, whereas 20% of total students slightly agree with the question. We see that all technology students think that the curriculum is relevant to the latest technology. Almost 67% of students think their syllabus is relevant to the latest technology.

The study demonstrates the response to the statement that 'Present Curriculum is not capable of meeting the industry demand'. The response from different technology is slightly different from each other. Two-thirds of the total student agrees with the statement, whereas, the rest does not agree with this. It can be said from this result that the existing curriculum is not capable of meeting the industry demand. It needs more updates or reforms to meet industry demand.

From the student's response, we see that slightly more than half of the total students agree with the statement—the curriculum will not entitle students to gain a future career. Others think that the curriculum will entitle to gain a future career for them. 33% of students agree and 15% strongly agree with this, whereas, 24% of students disagree and 8% strongly disagree with the statement. So, some challenges were found in the curriculum to produce competent diploma engineers from government polytechnic in Sylhet division.

Two-thirds of students respond positively to the statement—the present curriculum and lab instrument are commensurate. They

believe that the current curriculum and lab equipment are adequate. Where 45% agreed, 13% strongly agreed and 16% slightly agreed; 13% of students disagreed with the statement, and 4% strongly disagreed with the statement. We found that the present curriculum and lab instrument are commensurate.

INSTITUTIONAL CHALLENGES

Habiganj Polytechnic Institute established in 2002, Moulovibazar Polytechnic Institute established in 2010, Sylhet Polytechnic Institute established in 1955. There are some institutional challenges in these polytechnics. The number of students in these polytechnics is almost doubled since their inception. Although Sylhet Polytechnic has inadequate residential facilities for students, there are no residential facilities in Habigonj Polytechnic. Although there is inadequate accommodation for the students of Moulvibazar Polytechnic, there is no provision for teachers' accommodation.

As regards the statement ''Equipment is enough for the number of students in the workshop'' that more than 30% of Civil Technology students disagree with statement that equipment is enough for the number of students in the workshop. At the same time, almost one-fourth of them agree with the same statement. However, an equal number of respondents (11%) slightly agree and strongly agree with this ask. So, it is shown that for Civil Technology, the equipment is not enough for every student in the laboratory. more than 35% of students of Computer Technology agree that the equipment is enough for the number of students. Almost one-fourth of them deny this statement. However, around 22 % of them slightly agree, which is greater than the total proportion of slightly disagree, strongly agree, and strongly disagree.

The result shows that workshop equipment is enough for every student of Computer Technology. Nearly 30% of total Electrical

Technology students agree that the lab equipment number is sufficient for the number of students. On the other hand, around 22% disagreed with that question. In addition, more than 18% of the students slightly agree and about 15% strongly disagree with the question. Other categories of responses are not worthy of consideration.

The result for Electrical Technology summarizes that instruments are not enough for every student. Most of the students (25%) in Mechanical Technology agree that the number of experimental equipment is enough for the number of students. However, just over 20% of the students disagreed with the asking, which is similar to slightly disagreeing. Surprisingly similar numbers of students strongly agree and disagree with this question (around 14%). Mechanical Technology shows that the equipment is not enough in the workshop.

In response to the question of not having enough infrastructure for learning properly, a nearly equal number of Civil Technology students (36%) expressed agree and disagree, almost twice the strongly agree figure. The other three categories are close to 10 % of the total opinion. The result shows that three polytechnic institutes' infrastructure is inadequate for Civil Technology. More than half of the total Computer Technology students agree that they do not have enough infrastructure for proper learning, while only 1% of them strongly disagree with that. However, more than 30% of students strongly and slightly agree with this ask.

Responses for Computer Technology show that infrastructures are very few learning properties. Around 60% of Electrical Technology students agree that they do have not enough infrastructure for proper learning. Very few (almost 3%) strongly disagree with this statement. However, 13 % slightly agree and 15% strongly agree with this question. The infrastructure for Electrical Technology is

not enough in three polytechnic institutes in Sylhet division. Above 40% of Mechanical Technology students agree that they do not have enough infrastructure for proper learning. Whereas very few of them (2%) strongly disagree with this statement. However, an almost similar number of students (21%) strongly agree and disagree with this question. We find that there is a huge shortage of infrastructure for Mechanical Technology in this study area.

The percentage of responses to the statement 'Teacher is not familiar with the scientific and practical knowledge in the field of specialty' separately. Below 40% of students of Civil Technology disagree that their teacher is not familiar with the scientific and practical knowledge in the field of specialty. However, almost similar numbers of students (14%) strongly disagree, agree, and slightly disagree with this question. The result shows that the teacher of Civil Technology is familiar with the scientific and practical knowledge. Almost 26 % of Computer Technology students agree, whereas, almost 23 % disagree with the question that teacher is not familiar with the scientific and practical knowledge in the field of specialty. So, it can be said that in Computer Technology almost half of the students think that teachers are not familiar with the scientific and practical knowledge. An almost equal number of Electrical Technology students (30%) agree and disagree with the question that their teacher is not familiar with the scientific and practical knowledge in the field of specialty. The result summarizes that more than half of the students think that the teachers of Electrical Technology are not familiar with scientific and practical knowledge of the specialty. 26% of Mechanical technology students agree with the question that their teacher is not familiar with the scientific and practical knowledge in the field of specialty. However, 22 % of the total students strongly disagree with this statement.

In response to the statement 'Skilled manpower to operate machines is inadequate' separately for all four technologies. More than 46% of Civil Technology students agree that skilled manpower to operate machines is inadequate and only around 17% expressed disagreement against this statement. In addition, an equal number of students (6%) strongly agree, strongly disagree, and slightly agree in response to this question.

Most of the students of Civil Technology think that the skilled staffing is inadequate in the study area. Above 50% of Computer Technology students agree that skilled manpower to operate machines is inadequate and only around 6% expressed disagree with this statement. Also, around 18 % of them slightly agree with this question which is greater than the sum of the other three categories. Above 55% of Electrical Technology students agree that skilled human resources to operate machines are inadequate and only around 8% expressed disagree with this statement.

Also, more than 11 % of them slightly agree with this question which is 7% less than the sum of strongly agrees student's number. Around 55% of Mechanical Technology students agree that skilled manpower to operate machines is inadequate and only around 6% expressed disagreement against this statement. Also, almost 17 % of them each slightly agree and strongly agree with this question.

The result for the statement 'Equipment in the department is not compatible with those available in the labor market'. It reveals that around 30 % of Civil Technology students agree that equipment in their department is incompatible with those available in the labor market. However, similar numbers of students slightly and strongly disagree with this statement (20%). More than 16% and 7% strongly agree and slightly agree with this question respectively. From the result, it can be said that Civil Technology equipment is incompatible with those available in the labor market. Most Computer Technology

students (around 46 %) agree that equipment in their department is incompatible with those available in the labor market. Although around 14% of students equally strongly agree and disagree with this question. However, almost 17% of the total figure was slightly agreed upon.

The result is almost the same as CT. Equipment for Computer Technology is incompatible with those available in the labor market. Slightly above 50% of Electrical Technology students agree that equipment in their department is incompatible with those available in the labor market and around 18% and 16 % of the total figure also slightly and strongly agreed, respectively. Only around 4% of the students strongly disagree with this statement. As per the response from Electrical Technology, the equipment is incompatible with those available in the market. 50% of Mechanical Technology students agree that equipment in their department is incompatible with those available in the labor market and around 10% slightly agreed. However, only around 2 % of the students strongly disagree and 9% disagree with this statement. Response from Mechanical Technology is also the same as the other three emerging technology in this study area. The equipment used in these polytechnic institutes is incompatible with those available on the market.

CHALLENGES FACED BY THE STUDENTS

Students face different types of challenges in their student life to become competent. In the last few years, many students are enrolled in technical education. So the challenges of the students increase with the number of students. This study sets five questions under challenges faced by the students' criteria. These five questions were asked to the students to know their responses. Almost 42% of students agree that the institute provides the opportunity to field training in labor market institutions, whereas around 25% of students disagree

with the question. However, the proportion of strongly disagree and slightly agree are nearly identical, at around 9%.

The result shows that the institute allows the students of Civil Technology to field training in labor market institutions. More than 37% of students of Computer Technology agree that the institute provides the opportunity to field training in labor market institutions, whereas half agree and around 19% disagree with the question. But 22% of the total students responded slightly agreed. The students of Computer Technology also get the opportunity to field training in labor market institutions. For Electrical Technology, 36.4% of students agree that the institute provides the opportunity for field training in labor market institutions, whereas a quarter of the students disagree with this statement.However, around 20% of them strongly agreed with that question.

The result for Electrical Technology is the same as CT and CMT. Institutions provide a vast opportunity to the students to field training in labor market institutions. From the response of Mechanical Technology, 43% of students agree that the institute provides the opportunity to field training in the labor market institute. More than 13% of students disagree with this. Again, more than 22% strongly agree and 7% slightly agree with this statement. On the other hand, over 10% of students strongly disagree and 4% of students slightly disagree with this statement. Summary for Mechanical Technology is that the institute provides the opportunity to field training in labor market institute.

It reveals that slightly more than 27% of Civil Technology students agree that they can pay attention to their whole class. At the same time, only 11% disagree with that asking. However, around 13% of them slightly agree with this statement. The result gives the information that the students of Civil Technology can pay attention to in their class. Most of the students (around 60%) of Computer Technology

agree with the statement of question 2. On the other hand, nearly 6% of students slightly disagree with this question. Although 17% strongly agree, around 14% slightly disagree with the question.

More than half of the Electronic Technology students agree that they can pay attention to their whole class. In addition, about 30% of the students strongly agree with this ask. However, almost 5% of the students disagree with this statement. Almost all students in Electrical Technology are attentive in their class as per the response.

More than 41% of students agree that they can pay attention to their whole class. In addition, around 40% of students strongly agree with this question. Around 6% of them slightly disagree with that statement. As per students' responses, we can see that students of Mechanical Technology are attentive in their class. So, we can say that in these study areas, students are very attentive in their class.

For the statement 'can attend classes regularly on time', around 55% of students of Civil Technology strongly agree that they attend their class regularly on time. Also, over 36% of the students agree with this statement. Nearly 4% of students disagree with this statement. So, the summary is that the students of Civil Technology attend their classes regularly.Around 54% of students of Computer Technology agree that they attend their class regularly in time. Also, approximately 32% of the students strongly agree with this comment. 3% of students disagree with this question. It can be said from the result that the students of Computer Technology also attend their class regularly.

For Electrical Technology, around 50% of the students strongly agree that they attend their class regularly on time. Also, 41% of the students strongly agree with this comment. However, a negligible portion of them disagrees with this statement. As per student response, it is clear that the students of Electrical Technology attend their class regularly. Half of the Mechanical Technology students strongly agree that they attend their class regularly on time. Also,

slightly over 41% of the students agree with this comment. However, more than only 4% of them slightly disagree with this question. Like other emerging technology, it can be seen from the responses that the student of Mechanical Technology is also very attentive in their class.

Around 47% of the Civil Technology students strongly agree that they can submit their assignments/reports on time. Also, 40% of the students agree with this comment. However, nearly 4% of them slightly disagree with this question. The result shows that the students of Civil Technology submit their assignments timely.Around 41% of the Computer Technology students agree that they can submit their assignment/report on time. In addition, above 37% of the students strongly agree with this comment. However, nearly 17% of them slightly agree with this question. It can be seen from the response of Computer Technology that the students submit their assignments timely.

Around 50% of the Electrical Technology students agree that they can submit their assignment/report on time. In addition, about 40% of the students agree with this comment. On the other hand, only 1% of the students disagree with this question. The result is also the same in Electrical Technology. It has been seen that the students of ET submit their assignments timely also.Around 53% of the Mechanical Technology students strongly agree that they can submit their assignments/reports on time. Also, near about 37% of the students agree with this statement. However, almost 3% of the students slightly disagree with this question. The result summary for Mechanical Technology students is also the same as other technology in this area. They also submit assignments regularly and timely.

Around 50% of the Civil Technology students agree that they have enough confidence to do a lab in any industry. Also, nearly 22% of the students strongly agree with this question which is 5% higher than the

slightly agreed portion. However, an equal number of students (5%) disagree and strongly disagree with this question. The result shows that the students of Civil Technology gain enough confidence to do lab after conducting it in the institutions. Around 43% of the Computer Technology students agree that they have enough confidence to do a lab in any industry. Also, a similar figure (around 23%) can be found in the slightly agree and strongly agree with portion. However, almost 6% of the total students disagree with that. So, it can be said that the Computer Technology students also have the confidence to do a lab individually.

Around 34% of the Electrical Technology students agree that they have enough confidence to do a lab in any industry. Also, 31% of the total number strongly agree with this question. However, an equal number of students (7%) disagree and strongly disagree with this question. From this, it can be seen that the students of Electrical Technology also have the confidence to do a lab individually in any industry. Around 50 % of the Mechanical Technology students agree that they have enough confidence to do a lab in any industry. In addition, over 26% of the total number strongly agree with this question. However, only 9% of the students disagree with this question. Response from the student of Mechanical Technology is also the same as the other technologies. They also have the confidence to do lab individually in any industry.

In average, 39% of all respondents think that the institute provides the opportunity to field training in labor market institutions. 14% of students strongly agree and 12% slightly agree with this statement. On the other hand, 21% of students think that the institute does not provide the opportunity to field training in labor market institutions. Here, 8% of students strongly disagree and 5% of students slightly disagree with the statement. The result summarizes that the institute provides the opportunity for the students to field training in labor

market institutions. Especially for final semester students, it is named "industrial attachment".

Similarly, 48% of students agree that they are attentive in class, 30% of students strongly agree that they are attentive in the whole class, and 12% of students slightly agree with the statement. Very few students do not agree with this. Here, 5% of students disagree with the statement, 4% of students slightly disagree, and negligible number (0.3%) strongly disagree with this statement. The data summarize that students of all technology are attentive in their class.

Of all students, 44% of students agree, and 46% of students strongly agree that they attend their class regularly on time. 5% of students slightly agree with the statement. 3% of students slightly disagree, and 2% of students disagree with this statement. From data, it is seen that almost 95% of total students attend their classes regularly.

As per the responses from all students to the statement that ' can submit assignment/report on time,' 46% of students strongly agree and 39% of students agree with this statement, while 9% of students slightly agree. A negative response to this question is very few. 1% of students disagree and 4% of students slightly disagree with this statement, while only 1% strongly disagree with this statement. From these statistics, it is clear that students of this study area submit their reports or assignments timely.

The data of responses to the statement 'have enough confidence to do a lab in the industry,' 43% of students agree, 26% of students strongly agree, and 19% of students slightly agree with this statement. On the other hand, 7% of students disagree, 4% strongly disagree, and 1% slightly disagree with the statement. It can be said that more than 85% of the total students are confident to do a lab in any relative industry.

CONCLUSION

This research provides and idea about the main obstacles to producing competent graduates in line with industrial demand. As this research conducted on polytechnic institute, if we find out the actual challenges and problems of polytechnic institutes and solve, them then it will help to produce competent graduates. Consequently, this research has a positive impact on the TVET sector.

The present curriculum is evaluated considering five parameters: theory part impact on students, technological relation, industry demand, career prospective, and workshop facilities. In the case of the theoretical part of the curriculum maximum number of students from selected technology of three polytechnic institutes agrees that the theory part of the existing curriculum burdens their study. Students of the polytechnic institute stated that there is a significant gap between their current curriculum and the market demand.

Institutional capacity is one of the vital parameters affecting competent graduates. From this study, it is clear that a number of instruments is not enough in the laboratory to conduct the test for all students at a time, which is an obstacle to producing competent graduates. On the other hand, though in the polytechnic institutes, a significant number of student enrollment increased, the number of infrastructure facilities is not increased accordingly.

According to this study, almost half of the total respondent believes that the teachers of these technologies are familiar with scientific and practical knowledge in the field of specialty, and the other half believes that teachers should be more capable of scientific and practical knowledge. Skilled manpower is one of the most significant parameters in producing competent graduates for each institute. However, it has been seen that there is an acute crisis of skilled manpower inside the institutions. More than half of the total

respondents of all technologies of these polytechnic institutions agree that the laboratory equipment is not compatible with those that are available in the market.

Students' ability and performance are considered as a significant element in evaluating the competency of the polytechnic diploma graduate. This study finds that more than one-third of the students got the opportunity of field training in industries. Likewise, most of the students are confident to do the sessional jobs individually after finishing the relevant lessons. In addition, they are sincere about their class attendance. Also, 50% of them can submit their assignment on time. As a result, just below half of them have enough confidence to work in any industry practically.

The key informant interview from eight industries commented on several aspects regarding polytechnic institutes, their graduates, and their entry qualifications to the industry. Mainly they focused on various lacking in communication skills and teamwork skills. Also, minimal professional adequacy was found in the diploma graduates. Memorandums of understanding between polytechnic and industry are quite low in number. IT and electrical instruments are updated frequently in the industry, but for the civil and construction sector takes time to update and depends on market availability and shipment. The opportunity of industrial training for diploma graduates is meager. Another finding from a key informant is that instruments in the industry are based on production but in polytechnic institutes, instruments are based on training purpose. Industry instruments are updated more frequently than the polytechnic institutes. Few other recommendations include:

- Need to increase effective linkage of the polytechnic institutes to private industry;
- Teachers' training is needed with modern technology;
- Upgradation of the curriculum with market demand; and
- Need industrial attachment for teachers.

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8

EMPLOYMENT STATUS AND CHALLENGES FOR FEMALE DIPLOMA ENGINEERS GRADUATED FROM POLYTECHNIC INSTITUTES OF BARISHAL CITY

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INTRODUCTION

The importance of TVET for the nation's sustainable development has been widely recognized. Female employment manifestly plays a vital role in socio-economic development. Diploma engineering education is an essential branch in the TVET sector and a carrier-oriented education. Female participation in the TVET sector plays an important role in increasing women's empowerment. But it is seen that the enrollment of female students in the Diploma in Engineering Course is yet comparatively low (13% in 2014) (BTEB, 2016).

To understand what factors, influence women's labor participation in Bangladesh, 'Raihan and Bidisha (2018) infer the value-supplying function when determining the determinant of women's labor

participation in a particular board category: individual cause, family cause, gender norm variable and geographical variable. They concluded that not only has the participation rate and the size of the workforce changed in recent years, but most women are stuck in unpaid or low-skilled occupations. Patriarchal gender norm-centered factors and domestic responsibilities serve as important barriers to women's participation in the labor market. They reveal that women with relatively high levels of education are finding it difficult to find jobs.

In a similar vein, another study concludes that women's participation in self-employment is positively influenced by education and resources. It is negatively affected by the number of small children and male earners. Women's participation in casual jobs is positively related to lack of resources and negatively related to the presence of a young child, marriage, number of male earners, and education (Rahman and Islam, 2013).

The Government has put enormous efforts into increasing enrollment, but there are numerous socio-economic barriers to achieving the desired goal. One of the most important causes of this problem is that there is no sufficient and suitable employment for female diploma engineers. As a result, female diploma engineers remain jobless. New female students also lose interest in enrolling in this sector. In this context, this study finds out the employment status and challenges of female diploma engineers who graduated from the polytechnic institute of Barisal city. Two research questions inform this study—(a) What is the present employment status of female diploma engineering graduates? and (b) What challenges do female diploma engineering graduates face in finding work?

There are six polytechnic institutes in Barishal City. These are Barishal Polytechnic Institute, Infra Polytechnic Institute, Ideal Polytechnic Institute, Technocrats Polytechnic Institute, United

Polytechnic Institute, and Dynamic Polytechnic Institute. A total of 506 female diploma engineers graduated in 5 years, from 2015 to 2019 from the polytechnic institutes of Barishal city are under study population. A questionnaire survey was conducted amongst 166 graduates. Also, 3 FGDs, 6 KIIs, and four personal interviews were commenced for qualitative data (see Annex for a detailed methodological note).

The study is presented in three sections. The following section analyses the employment status of female diploma engineers. The third section highlights the challenges female diploma engineers face in the labour market. The conclusion is drawn in the last section.

EMPLOYMENT STATUS OF FEMALE DIPLOMA ENGINEERS

The overall employment status of female diploma engineers is scanned. The scenario of status is that out of 166 respondents, only 38 are employed. In this analysis, we found that 23% of female diploma engineers are employed and 77% are unemployed. In the BBS report of Labor Force survey, the female labor force participation rate in 2016/17 is 36%. According to the Report of the 'TVET Graduate Tracer Study 2020' of DTE status of diploma graduates for both boys and girls of (a) Graphics Arts Institute, Dhaka as: job 52%, higher education 12%, self-employment 3%, and not in education employment or training 33%; (b) Rangpur Polytechnic Institute as: job 28%, higher education 9%, self-employment 2%, and not in education employment or training 61%; (c) Cox's Bazar Polytechnic Institute as: job 29%, higher education 14%, and not in education employment or training 57%. Since most of the girls from the Barishal region study at the polytechnics of Barishal city, it is found in this research that a large percentage (77%) of female diploma engineers from this region are unemployed.

Employment Status based on organization and technology relevancy

Based on the type of organization where the female diploma engineers are employed, whether Government or Private (company, consulting firm, educational institute, NGO etc.), the employment status of female diploma engineers is scanned. The present situation is that out of 38 employed female diploma engineers only eight in government service and the rest are in private/NGO/part-time job. Among the employed female diploma engineers (38), a significant number (10) of them are doing technology-irrelevant job (Nursing, Non-tech part-time teacher, accountant, receptionist etc.), indicating that there is no suitable technology-related job available.

Status of degree-related jobs

Among 166 female diploma engineers, 38 are in a job, out of which only eight are in government job, and 30 are doing private/NGO/ part-time jobs. Out of eight female diploma engineers who are in govt. job, only five are doing degree-related jobs (SAE/ NTRCA Trade Instructor), rest three are doing non-degree related jobs (primary school teacher/ Cr. Ins./ defense). In percentage, 18% are doing private or NGO or part-time job, 3% are doing degree-related govt. job, and 2% are doing non-degree related govt. job. In this analysis, we have seen that the scenario of degree-related govt. job of female diploma engineer is very negligible (3%).

We scanned what percentages of female diploma engineers are doing their degree-related jobs in all respects. We found that out of 38 employed diploma engineers, 22 are doing their degree-related job (Sub-Assistant Engineer or equivalent or higher level), and the rest are doing other non-degree related jobs (lower grade job: such as Craft Instructor, Nurse, Technician, Primary School Teacher). A significant percentage (42%) of employed female diploma engineers got no opportunity to do a job related to their studied degree.

Category of Job

Female Diploma Engineers are doing mainly 3 types of job: Engineering or Related Managerial, Teaching or teaching related and other types. Here we scanned the percentage of each category. We found that 10% of total respondents are doing teaching or teaching-related jobs, 9% are doing Engineering or related Managerial jobs, and the rest 4% are doing other jobs. It implies that they can do engineering, managerial or teaching-related jobs.

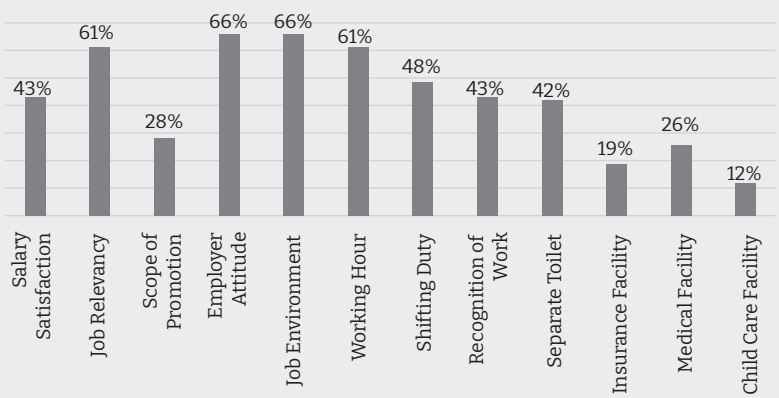
Location of Job

Here we scanned the job location of employed female diploma engineers. Out of 38 female diploma engineers, 22 are doing jobs in home district Barishal (58%), 09 are in Dhaka city (24%), 03 are in Narayangonj, near Dhaka, and 01 each in Jhalokathi, Patuakhali, Mymensing, and Manikgonj. It implies that the majority of employed female diploma engineers like to do the job in the home district/city.

Job Satisfaction Level

Here we examined the job satisfaction level of employed female diploma engineers regarding salary satisfaction, job relevancy, the scope of promotion, employer attitude, job environment, working hours, shifting duty, recognition of work, separate toilet, insurance facility, medical facility, and child care. A 5-point Likert scale is used for assessing the variables of the questionnaire. We found the satisfaction levels as salary satisfaction 43%, job relevance 61%, scope of promotion 28%, employer attitude 66%, job environment 66%, working hours 61%, Shifting duty 48%, recognition of work 43%, separate toilet 42%, insurance facility 19%, medical facility 26% and child care 12%.

Chart 8.1: Level of Satisfation

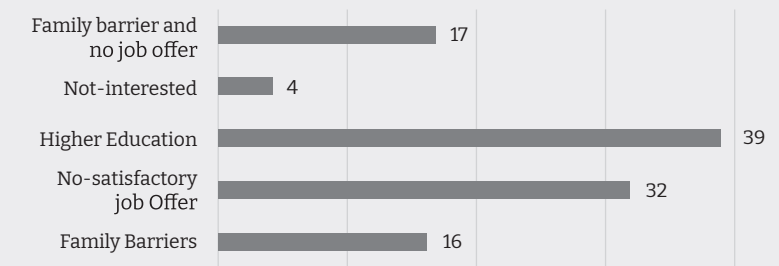


Source: Field Survey 2022

Causes of Unemployment

We identified five reasons for not getting a job asking female diploma engineers why they didn't get a job. Out of 128 unemployed respondents, 16 said family barrier (such as marriage, small baby, husband does not like etc.), 32 said no satisfactory job offer, 17 said both family barrier & no satisfactory job offer, 39 said continuing higher education, 04 said no interest to do a job and 03 showed other reasons (such as illness/sack in covid'19 situation/waiting for govt. job).

Chart 8.2: Causes of Unemployment (% of responses)



Source: Field Survey 2022

Status of Higher Education

Here we examined the status of higher education. Out of the total respondents, 166, only 46 are engaged with higher education, of which five female diploma engineers are awarded B.Sc. Engineering degree and the rest 122 are not engaged with further education.

We scanned in what location female diploma engineers are completing their further education. Here we found that out of 46 female diploma engineers of those who are engaged in further education, 28 (61%) are in the private university located in Barishal city, 16 (35%) are in the private university of Dhaka city, and only 02 (4%) are in the public university located in Gazipur (DUET).

CHALLENGES FACED BY FEMALE DIPLOMA ENGINEERS

Analyzing the information from respondents, FGDs, KIIs, and Personal Interviews, challenges and barriers of target female diploma Engineers are found out. Key information regarding challenges and barriers are pointed out under this headline given below.

The highest number of interviews faced by the female diploma engineers those who are employed is 15, and lowest number of interviews is 02. On the other hand, the highest number of interviews faced by the Female Diploma Engineers those who are not employed till now is also 15 and the lowest number is 0.

Most of the girls studying in the polytechnics of Barishal city are from the Barishal region, so this study has tried to find out their regional challenges to be employed. The challenges found through research are: a) Unavailability of technology-related jobs for Female Diploma Engineers in Barishal Zone, b) Going to Dhaka or a far distance from Barishal to participate in the interview, c) Cost of conveyances for facing the interviews, d) Recruitment on low pay in the private sector of Barishal City. Some identified challenges may be considered as typical, including: a) excessive non-refundable

application fees for jobs, b) excessive working hour in private sectors, c) seeking experience for job and d) considered as incapable.

Most of the respondents expressed that the main barrier for employment in this region is "the distance and long journey to appear in front of an interview board in Dhaka for a job". They also expressed that for long distance journeys, parents/family does not want to leave alone due to security issues. Some of them also added that husband or family makes a barrier to doing a job. Some of them added that family and child management, night/evening shift duty, economic problems, gender inequality, lack of basic employability skills, and lack of job searching skills as barriers.

The respondents were asked to know their field of interest in job sectors. A major portion of female diploma engineers expressed their field of interest for jobs accordingly in: teaching is the first option, followed by Sub-Assistant Engineer, any job in a government organization, and a white-collar job as the fourth option.

CONCLUSION

A significant portion of Female Diploma Engineers is unemployed, causing of no better job offer & family barrier for distance and security issues though most of them are interested to do a job. Through the point of view of employer attitude, it is clear that performance of Female Diploma Engineers is satisfactory for any type of job, but opportunity of employment is not so satisfactory. Most of them who are employed are also not satisfactorily paid. For increasing the enrollment of female student in the Diploma in Engineering course, job opportunities and other facilities must be increased for the developing of the aspiration of the intake female students. To increase women empowerment in Bangladesh, it is essential to improve female intake in diploma in engineering courses.

This study finds the scenario of employment status as: only 23% of Female Diploma Engineers are employed; among them, only 3% are doing their degree related govt. job (sub-assistant engineer or equivalent), 2% are doing non-degree related (lower than sub-assistant engineer grade) jobs, and 18% are doing private or NGO or part-time jobs. Irrespective of govt. job 13% are doing their degree related job and 10% are doing other lower than sub-assistant engineer grade job (out of employed 23%). Out of employed (23%) Female Diploma Engineers: 9% are doing engineering related jobs, 10% are doing teaching-related jobs, and the rest 4% are doing other jobs. A significant portion of employed Female Diploma Engineers (61%) are doing jobs in their home district/city (Barishal); 25% are in Dhaka, and the rest are in others districts. 25% of total Female Diploma Engineers are pursuing further education, of which 61% are doing so in their home district (Barishal), 35% are in Dhaka, and the remaing 4% are in DUET (Gazipur).

Most of the job interviews are commencing in Dhaka city. Due to long distance, travel-times, cost, and security issues, the family makes it a barrier to going to Dhaka alone for a job interview. Due to the unavailability of job sectors in Barishal city, it is nearly impossible to obtain a standard-paying work in the private sector. As a result, 77% of Female Diploma Engineers passed from polytechnic institutes of Barishal city are unemployed. Overcoming the family barrier, traveling to Dhaka for a job interview, and security issues are the main challenges to being employed for a Female Diploma Engineer passed from Barishal Polytechnic Institute.

The vast majority of girls enrolled in Barishal city's polytechnics are from the Barishal Division. If it is possible to hold job interviews for government or corporate organizations in Barishal, the employment status of Female Diploma Engineers from this

region will improve. It is undeniable that improved employment status improves human living standard. Moreover, a reduction in unemployment will mobilize the elimination of poverty, and boost women's empowerment.

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FINANCIAL OPPORTUNITIES AND CHALLENGES OF DIPLOMA GRADUATES TO BECOME ENTREPRENEUR

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INTRODUCTION

Reducing youth unemployment has become one of the most difficult challenges for Bangladesh, where every year, a huge number of youths enter the job market. At the same time, the country is going through a Demographic Dividend. So, in a nutshell, the country is going through an unemployment crisis. Bear the fact in mind, the government has been taking initiatives to address the unemployment challenges. Strengthening Technical and Vocational Education and Training (TVET) is one of them. Every year more than 3.5 lakh students enroll in diploma engineering programs (BTEB enrollment report, 2021). After passing these diplomas, graduates extensively suffers unemployment crises. It is hardly possible to foster economic growth without ensuring the entrepreneurial effort of this

large group of youth. As a result, a self-driven and energetic young generation is expecting to enter the entrepreneurial market. They have the potential to bring Bangladesh to the golden age of development which will lead the country to the vision 2041 of becoming a developed country. Although the government have taken so many initiatives, entrepreneurship development is still unsatisfactory. For diploma graduates, the scenario is even worse. Many causes are identified behind this, but the financial barrier is the most important one. The government has taken initiatives, but the output is not up to the mark. So definitely, there is a gap. This study is an endeavor to find out the gap. This study will find out the institutional financial opportunities and the challenges that graduates faces in obtaining such assistance. Primary and secondary data are collected from diploma graduate entrepreneurs, banks, NGOs, teachers of polytechnic institutes, TVET officials, and researchers through a survey questionnaire, FGD, KII, and desk review.

To sustain the reputation level of our country in this field, the Diploma graduates can play a vital role. The government of the People's Republic of Bangladesh also emphasizes a lot to inspire Diploma graduates to become an entrepreneur to gain the status of a developed country by 2041. Although there are many challenges of becoming an entrepreneur for the diploma graduates, the most popular challenge is their financial difficulties. For diploma graduates, becoming an entrepreneur is highly important for coping with the modern world and empowering the younger generations. However, when they try to implement some ideas upon creativity, they lag behind due to financial barriers.

In this study, we will explore the opportunities and challenges diploma graduates face in becoming an entrepreneur. This will help them know ahead of time what kinds of help they might get from State-owned and Private Banks and NGOs, as well as what problems

they might face. Even if they get financial facilities from these institutions, whether that amount of loans or facilities is quite enough or not to continue their business while being an entrepreneur as a diploma graduate.

Every year Bangladeshi polytechnic Institutes under Technical and Vocational Education and Training (TVET) produce thousands of graduates, who run to get suitable employment opportunities. Also, graduates fail to create market demand with their traditional degrees. There is a rare similarity between institutional education and job market education. This is why fresh graduates from these institutions start reading job-related books to get suitable employment opportunities or stay home as a burden for the family as well as for the country. Do these institutions fail to create market demand and job opportunities for graduates by degrees? The left-out graduate becomes disheartened and frustrated due to a lack of opportunities in getting suitable employment.

The Government of Bangladesh pays attention to entrepreneurship education and encourage to become entrepreneurs. SME Foundation, BIDA-ESDP Project, Youth & Sports Ministry are now playing a crucial role in developing entrepreneurship education in Bangladesh but the complex processes of taking loans from financial institutions stopped a graduate to continue their business ahead. It is a great joy that they are promoting the entrepreneurial mind but a matter of sorrow that they rarely get financial support. Without solving complex loan procedures, the diploma graduate's entrepreneur cannot generate them from SME Entrepreneur to IDE Entrepreneur even if they lose their hope to becoming successful. So, exploring the opportunities and challenges is a must to inspire diploma graduates to become successful entrepreneurs. Entrepreneurship of Diploma Graduates is crucial for achieving sustainable economic development.

In becoming an entrepreneur, the main challenge is to overcome financial obstacles. The current study will explore the opportunities and challenges in getting financial assistance to become an entrepreneur for Diploma Engineering graduates. This study integrated quantitative and qualitative approaches. Primary data are collected through a desk review of bank circulars and directly from entrepreneur graduates through a survey questionnaire. Secondary data are collected through a desk review of similar research papers and newspapers. Several KII and FGD have been conducted to collect data. Considering the nature of the study, a semi-structured questionnaire was used as an instrument. Data are collected from 100 entrepreneur diploma graduates situated at different districts of Bangladesh. Another 15 samples are the financial institutions (Banks and NGOs), where 9 banks (4 state owned and 5 private banks) and 6 NGOs. All are located at Gopalgonj district. These financial institutions (Banks and NGOs) are selected conveniently.

This paper is structured into three broad sections. The first section highlights the Purpose, Problem Statement, Background, Research Questions, Literature Review and Methodology. The second section provides description and statistics of data, interpretation of collected data, results and discussions, and the major findings. The third section contains key purpose, implications, and conclusion.

FINANCIAL OPPORTUNITIES AND CHALLENGES

This chapter will cover and explore the scopes of getting financial assistance from government and private Banks as well as NGOs that may benefit the young diploma graduates who have potentiality in becoming an entrepreneur. We have taken nine commercial banks and six private banks, and six NGOs as financial institutions. A summary of key points related to opportunities for financial assistance from financial institutions is given below (in percentage):

Opportunities from Financial institutions.

Gender			Loan Amount (taka)			Bank Statement			Mortgage			Certificate as a social guaranty			Guarantor	
Women Advantage	No Advantage	1-2 lakh	2-5 lakh	5-10 lakh	above 10 lakh	All of the above	Mandatory	Optional	Relax for New Entre	Mandatory	Optional	varies	Yes	No	Mandatory	Optional
73.3	26.6	13.33	6.66	0	0	80	60	33.33	0	60	33.33	13.33	20	73.3	86.6	13.33

Source: Field Survey 2022

The above data demonstrates that there are advantages for women entrepreneurs; the loan amount ranges from 1-10 lakh taka; a bank statement is required; a mortgage is mandatory; a diploma engineering certificate is not accepted in as a collateral; and a guarantor is mandatory for getting assistance from financial institutions.

Among the total respondents who aspired to be an entrepreneur, Computer/Telecom Technology graduates were the most at 55%, and the lowest were Electrical Technology graduates at 1%. Others technology, except Computer Technology, is less interested in becoming an entrepreneur. While conducting FGD, all of them agree that more investment or financial assistance is required except for Computer Technology due to the variation of equipment cost. Besides, the demand for every technology is not equal to the context of the present world.

The study shows that 56% of 'entrepreneurs' age at the startup of business is 18-24 years, and they are the most interested entrepreneurs. Almost one-third (30.3%) of entrepreneurs are 25-29

years old when they started their businesses. So, most entrepreneurs try to start the business graduation if they have no shortage of funds. The perfect age range is 18-29 years to start their business.

Among the total valid 89 entrepreneurs, 44% had capital of 1-2 lakh, 28%, 12%, 3% had capital of 2-5 lakh, 5-10 lakh, and greater than 10 lakhs, respectively, at the startup of the business. Moreover, almost 12.4% of entrepreneurs had less than 1 lakh capital. An FGD participant agreed to the same point that to increase the number of successful entrepreneurs; we need to increase their capital by providing loans or family support.

Only 26% did not require any help for taking out loans, whereas 72% of valid respondents required assistance from others like family, friends, relatives, or financial institutions.

Among the valid 72 entrepreneurs, 46% required 1-2 lakh taka capital, 24%, 19%, 3% required 2-5 lakh taka, 5-10 lakh taka, and greater than 10 lakh takas, respectively, at the startup of the business. Moreover, almost 8% of entrepreneurs require less than 1 lakh taka fund only at the startup of a business.

Among the total valid 90 entrepreneurs, 38% started an e-commerce business. We asked the respondents to choose their business among 17 types of the above businesses, where the majority start up with e-commerce. Almost 9% were educational service and food items respectively. The other types of business are almost the same poor interest to most of them. While conducting FGD, all of them agree that more investment or financial assistance is required except for Computer Technology due to the variation of equipment cost. Besides, the demand for every technology is not equal to the context of the present world.

A director agreed with the data analysis report of Type of Business that the majority of entrepreneurs are interested in doing e-commerce business because it requires low investment and they

fear starting businesses in other sectors due to large investments because they do not receive large financial support from Banks, NGOs, and other institutions. 'Among 65 valid respondents, small loan takers were 45% and only 5% were large loan takers. The SME and Medium loan types were 14% and 26%, respectively.

Among the valid 67 entrepreneurs, 31% got 1-2 lakh loans, 27%, 18%, and 9% got 2-5 lakh taka, 5-10 lakh taka, and greater than 10 lakh takas, respectively. Almost 15% of entrepreneurs only took loans less than 1 lakh taka.

Of the 78 valid respondents who wanted to be an entrepreneur and took loans, 49% were asked for bank statements as mandatory, and 45% said not mandatory but S/he can provide it if s/he wanted. Only 5% do not need it as a new startup.

Of the 75 valid respondents who wanted to be an entrepreneur and asked for a mortgage while taking loan, 40% were asked mortgage as mandatory, and 55% were not asked as mandatory. Only 5% do not need it as a new startup.

Among the valid 73 respondents, only 21% got the opportunity to provide their certificate or proof of creative work as a mortgage facility, whereas about 78% did not get that lucky chance. An FGD participant agreed that Financial Institutions should accept the certificate of Diploma Graduates who want to be an entrepreneur as a mortgage facility while taking bank loans.

More than three-fifth (62%) of the 74 valid respondents who wished to be an entrepreneur and took out loans were required to offer a guarantor, while 35% had the option to do so. Only 3% do not need it as a new startup.

Among 66 valid respondents for this research in 42% of cases bank or financial institutions set the period of loan, whereas in 38% of cases, banks or other financial institutions decided upon discussion with the applicants. The loan period was relaxed for 20%

of applicants. 64% had to show the deed of rental institutions to loan providers as a mandatory requirement, whereas only 32% of cases it was not mandatory.

Among 69 valid respondents for this research, 59% of loan applicants' rate of interest was set by banks or financial institutions, and for 22% of respondents' banks or other financial institutions decided after discussion with the applicants. The rate of interest was relaxed for 15% of applicants.

As diploma graduates, 39% of entrepreneurs got the priority to take loans easily, and 58% did not get this facility. The majority of the 83 valid respondents 70% tried to obtain loans from their parents/ relatives/friends, whilst just 30% tried to obtain loans from banks or other financial organizations.

Among the total valid 91 respondents, we found the recommendation that 60% recommend creating opportunities for new entrepreneurs may help to increase the number of diploma graduates becoming an entrepreneur. An FGD participant agreed that TMED/DTE/BTEB/Polytechnic Institutes could create opportunities for entrepreneurs by proposing financial institutions under the supervision of economists.

Among the total valid 91 respondents, we found the recommendation that 56% recommends ensuring incentives from government for diploma graduates, entrepreneurs may help to increase the number of diploma graduates becoming an entrepreneur. While conducting KII, a Director said that government should take proper steps to encourage entrepreneurs by creating new projects and government can formulate an easier loan policy for diploma graduates who want to be an entrepreneur upon discussion with Bangladesh Bank and other financial authorities.

Among the total valid 89 respondents, we found the recommendation that 31.5% recommend ensuring economic support

from industrialists for the diploma graduates' entrepreneurs may help to increase the number of diploma graduates becoming an entrepreneur. An FGD participant agreed that Industrialists or different governments body such as Ministry of Industry, Ministry of Youth, PM Office, FBCCI should train diploma graduates at free of cost and also provide financial support to diploma graduate entrepreneur who is meritorious but needy.

CHALLENGES

This section will cover and explore the challenges faced by the young diploma graduates who received loans from government and private banks as well as NGOs while starting or running their business as an entrepreneur.

The entrepreneurs who are not experienced enough have a poor possibility of getting loans. Almost three-fifth of them did not get loans due to lack of experience and 24% got loans without experience. An FGD participant agreed that most of the graduates lack awareness of the process of getting loans from financial institutions. Besides, government should relax the loan policy for the new startups.

We found upon research that 90% of valid respondents tried to take loans from parents, and 8%, and 2% tried from relatives and friends, respectively. This research shows only in the case of taking loans from persons, not banks or other financial institutions. It also proves that diploma graduates who want to be an entrepreneur mostly get support from parents, father, and mother. In rare cases relatives and friends support them in starting their business.

Among the valid respondents, 84% of entrepreneurs give the highest priority to their parents, whereas 12% and 4% give fairly and little priority, respectively. It proves that to get financial support from father or mother one should give priority as much as possible.

Among the respondents who did not get financial support from family/parents, 87% of respondents' family had financial crisis and only 7% of respondents' family could afford but do not provide support due to a lack of trust to the entrepreneur. An FGD participant comes to the point that diploma graduates rarely get financial support from their parents due to belonging to a lower middle-class family. Most of their parents lead their life from hand to mouth that's why they cannot support their children in becoming an entrepreneur. A director also agreed that most of the graduate's family backup is too poor to support them.

Among the respondents who tried to take loans from financial institutions, 96% tried to take loans from government or private banks and only 4% went to NGOs for loan purposes. So, we need to make bank loan facilities easier for them.

We found that 54% faced some complexity while taking loans from banks, and 42% faced no problem.

From 22 valid data respondents, 27% found the amount of loan approved by banks was very low and the interest rate was not much high. Only 5% found the interest rate is higher but acceptable. 36% faced guarantor complexity, which is definitely a threat to the entrepreneurs and 32% found lack of opportunity for the new diploma graduates' startups.

Among the valid 91 respondents, 43% recommended that the terms of bank loans be made easier in order to boost the number of diploma recipients in becoming entrepreneurs. Focus Group Discussion leads us to the conclusion that the loan obtaining process is overly complicated and should be simplified, particularly for diploma graduates. Some of them also stated that banks may issue loans, but they are uncertain as to whether entrepreneurs can make timely payments.

Among the valid 91 responses, 44% recommended that reducing the complexity of depositing funds could increase the number of diploma graduates becoming entrepreneurs. Among the same valid respondents, 40% suggested that a reduction in interest rates could help boost the number of diploma graduates becoming entrepreneurs.

CONCLUSIONS

The purpose of the study was to explore the scopes of financial assistance during a business and to find out the challenges that a diploma graduates' entrepreneur usually faces, so that the number of unemployed diploma graduates can be reduced satisfactorily and long cherished dream of Technical Education comes true. The majority of the diploma graduates who want to become an entrepreneur are from the department of Computer Science and Technology because being an entrepreneur is comparatively easy for them, whereas others were unable to continue their enterprises due to the high costs of equipment, etc. Many graduates faced financial difficulties while starting their businesses, even continuing it. Most of the loan takers faced bank loan complexity issues and the amount of loan was not satisfactory as per their requirement in becoming a successful entrepreneur. The good news is we discovered their interest in becoming an entrepreneur a lot, and upon making the bank loan policy for them easier, their interest might increase more than our expectations.

The major findings of the study are:

- More than half (54.6%) of the diploma graduate entrepreneurs are from computer or telecom technology. The second most entrepreneurs are from mechanical/ power/ automobile/ RAC technology (12.4%).

- More than half (56.2%) diploma graduate entrepreneurs' startup at the age of 18-24 years (just after passing) their graduation. A significant percent (30%) of diploma graduate startup businesses are at the age of 25-29.
- 43.8% of graduates' startup their businesses only with a very low (1-2 lakh taka) amount of capital. A few (3%) graduates get loans of over 10 lakh takas. Majority (72%) of graduates need to take loan/ financial assistance at the startup of the business. Around half (45.8%) of entrepreneurs required only 1-2 lakh taka.
- A significant percent (38%) of diploma graduate entrepreneurs start their business an e-commerce platform.
- More than half (58%) of diploma graduate entrepreneurs did not get a loan due to lack of experience. Around half (45%) diploma graduate entrepreneurs got a small loan, only (26%) got a medium loan, and a few (5%) diploma graduate entrepreneurs got a large loan. Only (31%) of diploma graduate entrepreneurs got a loan amount of 1-2 lakh. A few (9%) got an amount greater than 10 lakh takas. A significant percent (39%) of diploma graduate entrepreneurs got priority as a diploma engineer. More than half (57.8%) did not get priority as diploma engineer.
- The majority (70%) of entrepreneurs try to get a loan from parents, relatives, or friends. Only (30%) try from financial institutions. Most of (84%) the diploma graduated entrepreneurs avail most priority, but almost all (86.7%) parents cannot lend money due to poor economic conditions.
- Allmost all (96%) of the diploma graduate entrepreneurs got loans from bank, while just a small fraction (4 %) got from NGOs. More than half (54%) diploma graduated entrepreneurs faced problems while getting loan from banks. More than one-fourth (27%) of entrepreneurs claim the amount of loan is quite low, 32%

claim that the opportunity for a new entrepreneur is small, and 36% entrepreneurs claims about guarantor complexity.

- Around half (43%) of diploma graduated entrepreneurs need to relax the complexity of loan, the majority (60%) said they need to create opportunity for new entrepreneurs, 40% needs to decrease interest rate, and more than half (56%) wants incentive from the government, and 32% wants support from industrialists.

The Implications of the findings are as follows.

More emphasis should be given to the diploma graduate students of Information Technology such as Computer Science and Telecom Technology for increasing entrepreneurs. Special priority should be given to mechanical, power, automobile, and RAC (Refrigeration and Air-Condition) technology to create new entrepreneurs. Small enterprises should be prioritized and finance to encourage new diploma graduate entrepreneurs

There is a need to resolve financial crises after passing a diploma in engineering for those graduates who want to be an entrepreneur. Government, Banks, and NGOs should emphasize financing the diploma graduate entrepreneurs who are the owner of a running business.

There is a need to raise capital at a startup so that the graduate starts his business easily. A medium and large loan is not sufficient for entrepreneurs. There is a need to increase medium and large funding to boost diploma graduate entrepreneurs.

Financial institutions (Banks/NGOs) should provide innovative, energetic, and confident diploma graduates with more opportunities to obtain a loan for business start-up. Financial Institutions (Banks and NGOs) can be flexible/relax for entrepreneurs by providing loan facilities

for fresh diploma graduate entrepreneurs. Loan getting process should be much easier for a novice entrepreneur. Fresh entrepreneurs should be more emphasized by reducing the complexity.

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AQUACULTURE SKILLS ACQUISITION THROUGH TVET AND PRACTICES IN FISH PRODUCTION SELF-EMPLOYMENT

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INTRODUCTION

More than two million people, mostly young, enter the labor market every year, of which only half a million are being trained. The 2016-17 Labour Force Survey shows that millions of working-age populations are still out of the labor force, unemployed, or employed in the informal sector. Training oriented towards the labor market could transform these people into human capital and meet the industrial demand. There has been a significant structural economic shift from traditional agriculture toward export-oriented manufacturing and services sectors. The trend has raised the demand for skilled workers, particularly in export-oriented manufacturing industries.

About 63% of the country's total population belongs to the age group of 15 to 49 years, and 37% of the labor force is in the age group of 15-29 years. This relatively young population is often cited as the country's "demographic dividend." Bangladesh needs to capitalize on the youth force by skilling them before this demographic dividend disappears in a decade. Bangladesh has an ambitious target to reach middle-income status by 2024. To achieve this, the country should increase investment in socio-economic development, expand the share of manufacturing in GDP, increase and diversify exports, and produce quality skilled workers for internal and external labor markets.

Homestead pond culture is a small component of the more extensive household farming system. Homestead ponds are used for multiple purposes, including bathing, washing, and watering livestock. In addition, many households excavate soil to raise the base of their homes to avoid flooding. As a result, many households in rural Bangladesh possess a small pond close to their homestead (Huda et al., 2010; Kranzlin, 2000). In the past, ponds such as these were often used to capture wild fish which entered during flooding in the monsoon season. In some cases, they were stocked with fry harvested from nearby rivers but received very little if any, additional intentional management. As the availability of hatchery-produced seed has increased and management and yields have improved following the extension efforts of numerous successive large projects, fish culture has become an increasingly important way to use available pond resources. The promise of fish culture now serves as an incentive for homestead pond construction or renovation. For instance, a survey by Barman (2001) in northwest Bangladesh reports that more than half the small ponds located close to homestead areas and beside farmers' fields had either been dug or renovated in recent times for fish culture.

Anecdotal evidence suggests that as demand for cultured fish has risen along with the availability of seeds and knowledge of cultural practices, the potential value of ponds has increased to the point where these problems have diminished significantly. As a result, ponds are frequently leased out to others where intractable intra-household disagreements over benefit sharing would have previously prevented their productive use. This trend may encourage leaseholders of such ponds to manage them in a commercially oriented manner commensurate with their need to recoup lease costs (Barman et al., 2002a). Nevertheless, it seems plausible that many of the 7.82% and 1.42% of ponds listed by DOF as 'culturable' and 'derelict' respectively (i.e., those not utilized for fish culture) may remain in this state due to problems related to multiple ownership (DOF, 2010).

In Bangladesh, employers generally do not participate meaningfully in setting training policies or content or evaluating results. Similarly, public training institutions lack the initiative to consult employers in preparing and updating standards, and regular mechanisms for labor market analysis do not exist. A rigid training supply response is evident in the system's inability to modify curricula as needed, mainly due to administrative bureaucracy and lengthy training programs. Many vocational students have no intention of practicing the occupational skills they are studying and plan to pursue higher education, suggesting improper targeting. However, Government financing for TVET is inadequate, and cost-recovery schemes (e.g., fees from trainees) and other income-generation activities are insufficient. High failure and dropout rates, a low employment rate, and low-capacity utilization waste a substantial number of resources. Lack of institutional autonomy among institutions results in a lack of accountability. Besides, youths are constrained in accessing land, financial services, and other resources.

The study's main objective is to quantify the aquaculture-based knowledge and practical skills of students (especially female youths) participating in TVET and to enable them to find gainful employment in the private sector. This study was carried out in nine homestead mini ponds with different sizes ranging from 3.0 to 6.0 dec. in SadarUpazila of Kushtia District (23° 55′ 11.48″ N latitude, 89° 13′ 12.11″ E longitude), Bangladesh for a period of four months from January to April 2022. In the research work, the framers' ponds were selected for aquaculture activities, and for the trial, students from Class-IX and Class-X were selected who have their own homestead ponds. Nine ponds were grouped into three different treatments in triplicate, herein designated as Control (ponds operated by the fish farmers), Male (ponds operated by the male students), and Female (ponds operated by the female students). Sex reversed tilapia fingerlings were stocked in all plots with the same density of 100 dec^{-1}. All the proposed pre- and post-stocking protocols were recorded through formulated skill measurement sheets accordingly.

AQUACULTURE SKILLS ACQUISITION AND PRACTICES

Skill measurement

One of the major expected outcomes of TVET education is to develop the skills of the students enrolled with technical schools and Colleges. A skill measurement sheet was made to compare the aquaculture skills that male and female students learned through the Fish Culture and Breeding trade, as well as compare to the aquaculture procedures typically employed by fish farmers. (Appendix-A). Several indicators were measured based on the skill measurement sheet data, and the results are detailed below.

Aquatic weed control: Aquatic weeds are unwanted and undesirable vegetation that reproduce and grow in water. If left unchecked may

choke the water body posing a serious menace to pisciculture. They also provide breeding grounds and harbor predatory insects, limit living space for fish, and cause an imbalance in the dissolved oxygen budget. Some weeds release toxic gases that cause fish death and add a foul smell to the water. From the findings of this present research work, it was stated that the fish farmers and TVET students did the aquatic control in different ways. The effort required by the pond owners and reveals that the preparation of the pond was highest in the female treatment (100%), followed by the male treatment (91.1%), and lowest in the control treatment (62.2%).

Removal of unwanted and predator fish: Unwanted or "wild" fish may be predators that eat newly stocked fingerlings or compete with fingerlings for food. In either case, they create problems for the fish pond manager. When a pond is drained and dried before harvest, undesirable fish can be removed. . Poisons are effective in ponds that cannot be completely drained and dried. Poisoning should be done with caution to avoid harmful effects on humans, livestock, and the surrounding environment. According to the findings of this research, fish farmers and TVET students removed undesired and predatory fish in various ways. It was found that the pond preparation was highest for the female and male treatments (100%) and lowest for the control treatment (40%).

Liming: Applying lime ensures a healthy environment in the pond and increases productivity. Use 1kg lime per dec. in the basal level of the dry pond. Fill the pond with water after 2-3 days of applying lime. If it is not possible to make the pond dry, then use lime in the pond at the same rate. The tanks, which are acidic, are less productive than alkaline ponds. Lime is used to bring the pH to the desired level. According to the findings of this research work, fish farmers and TVET

students applied lime in various methods. The effort required by the pond owners was observed that the pond preparation was highest in the Female and Male treatments (100%) and lowest in the Control treatment (80%).

In addition, lime also affects increasing the pH, acts as a buffer, and avoids fluctuations of pH. It increases soil resistance to parasites, and its toxic effect kills the parasites; and hastens organic decomposition. At this point selection of lime has an important role in aquaculture.

From the findings of this present research work, it was stated that the selection of lime was done by the fish farmers and TVET students in different ways. The effort required by the pond owners was found that the pond preparation was highest in the Female and Male treatments (100%) and lowest in the Control treatment (80%).

Lime can be applied to the pond at any time of year. However, lime should be applied 15 days before fertilizer if the pond is to be fertilized. The process is necessary because lime combines with soluble phosphorous and becomes bound in bottom sediments. Phosphorous in pond sediment is released as pH rises to neutral or above and oxygen levels increase. Periodic lime application may be necessary if the pond is flushed by heavy runoff rainfall or acidic compounds enter the pond from the watershed. From the findings of this present research work, it was stated that the liming time was done by the fish farmers and TVET students in different ways.

As regards the proportion of the pond owners' necessary effort, it was found that the pond preparation was highest in the Female treatments (100%), followed by the Male treatments (86.66%), and was lowest in the Control treatments (60%).

Pre-stocking fertilization: Fertilization of the pond is an essential means of intensifying fish culture by increasing the natural

productivity of the pond. Applying pre stocking fertilization in the pond increases the growth and production of fish and the availability of natural food. From the findings of this present research work, it was quantified that the pre-stocking fertilization was done by the fish farmers and

TVET students in diverse ways. The percentage of the effort put forward by pond owners. It was discovered that Female treatments put forth the most effort (100%), followed by Male treatments (96.66%), and the Control treatment put out the least effort (53.2%).

In addition, the fertilization schedule has to be prepared after studying the quality of the pond soil. Both organic and inorganic (chemical fertilizer) fertilizers are necessary for the production of phytoplankton and zooplankton in the pond. For optimal result, a combination of Organic and Inorganic fertilizers may be used. The fertilization has to be suitably modified depending on the growth of the fish, available food reserve in the pond, Physico-chemical conditions of the pond, and climatic conditions. From the findings of this present research work it was calculated that the fish farmers and TVET students calculated the pre-stocking fertilization in various ways. As regards the proportion of effort made by the pond owners it was observed that the pond preparation was greatest in the Female treatments (100%), followed by the Male treatments (80%), and lowest in the Control treatment (40%).

Observation of natural food: Natural food is found naturally in the pond. It may include *detritus, bacteria, plankton,* worms, insects, snails, aquatic plants, and fish. Their abundance significantly depends on water quality. Liming and fertilization, in particular organic fertilization, can help to provide a good supply of natural food for fish. The presence of natural food in the aquaculture ponds is required to adjust artificial feed. The same was done by the pond owners in the

present research. From the findings of this present research work, it was calculated that the process of observing the presence of natural food was calculated by the fish farmers and TVET students. The effort expended by pond owners and reveals that the observation of natural food was highest in Female treatments (100%), followed by Male treatment (80%), and lowest in Control treatments (40%).

Fingerling stock management: Fingerling is a broad term applied to a juvenile fish that is about the size of a finger. The definition of what length classifies a fish as a fingerling varies between species. However, the Food and Agriculture Organization (FAO) generally defines a fingerling as ranging in length from 10 to 15 centimeters. If it seems like the fingerling is diseased or has any form of injury or deformity. A diseased fingerling could pose a health risk to other fishes on the farm. Good quality fingerlings will have a form that is free of diseases. Injury or any form of deformity that could lead to a loss. From the findings of this present research work, it was calculated that the fish farmers and TVET students did the process of acclimating to fish fingerling. It was determined that the performance of fingerling stock management was greatest in Female treatments (100%), followed by Male treatments (80%), and smallest in the Control treatment (40%).

Acclimating fish fingerling aims to decrease stress as much as possible. It is done by gradually allowing them to get used to their pond water's temperature, pH level, and water chemistry. From the findings of this present research work, it was calculated that the process of acclimating to fish fingerling was done by the fish farmers and TVET students. As regards the effort required by pond owners for the acclimation of fish fingerlings, and it was determined that the pond preparation was greatest in Female treatments (100%), followed by Male treatments (80%), and lowest in the Control treatment (60%).

Disinfection is employed as a common disease management tool in aquaculture establishments. It may be used as a routine practice in biosecurity programs designed to exclude specific diseases, as a routine sanitary measure employed to reduce disease incidence within farms, or in disease eradication (stamping out) efforts. The specific reason for disinfection will determine the disinfection strategy used and how it is applied. The findings of this present research work calculated how the farmers and TVET students were treating the fish fingerling. The effort required by pond owners to treat fish fingerlings was determined that the pond preparation was highest for the Male and Female treatments (100%) and lower in the Control treatment (66.66%).

Supplementary food supply: *Supplementary feeds* are feeds regularly distributed to the fish in the pond. They are made from a mixture of carefully selected ingredients to provide all the nutrients necessary for the fish to grow well. They must be made in a form the fish find easy to eat and digest. These feeds are difficult to make on the farm and usually quite expensive to buy. However, feeding time and application have a significant impact on aquaculture production. From the findings of this present research work, it was calculated that the process of observing the feeding time and application process was done by the fish farmers and TVET students. The effort required by the pond owners for supplementary food supply, which was determined to be highest in Female treatments (97.6%), followed by Male treatments (86.66%), and lowest in the Control treatment (40%) for pond preparation.

Sampling of Fish and adjustment of feed: Fish samples must be taken from every pond before harvest to ensure a consistently high-

quality processed product. The two main criteria to be considered are flavor and the condition (appearance) of fish. The most basic probability sampling procedure used in fish population sampling is simple random sampling, in which a predetermined number of sampling sites is selected from all possible sampling sites such that every potential site has an equal chance of being selected. From the findings of this present research work, it was calculated that the fish sampling process was done by the fish farmers and TVET students. It was determined that the performance was greatest in the Female treatments (100%), followed by the Male treatments (86.6%), and smallest in the Control treatment (40%) A sample represents an entire population and should be large enough to detect any variations. At the farm level, monthly sampling is ideal, although the shorter the time between samplings, the better the results. Sampling is the process of weighing fish to determine the growth rate and performance. Fish sampling involves taking weights and measurements such as body length and the weight of the fish population. The best time for sampling is in the morning or evening. At least 5 to 10% of the total population should be sampled to represent the entire fish population. It helps in observing the growth trends of fish, estimating the total weight of fish in the water and determining the condition of the fish in respect of health status and growth rate.

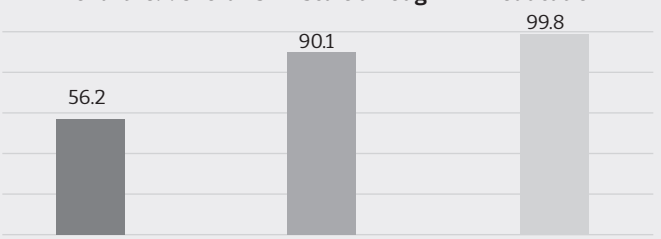
From the findings of this present research work, it was estimated that the process of calculating the required feed through sampling was done by the fish farmers and TVET students. The effort expended by the pond owners in calculating required feed, which was reported to be highest in Female treatments (100%), followed by Male treatments (84.44%), and lowest in the Control treatment (40%).

Harvesting of fishes: Harvesting fish means the number or weight of fish caught and retained from a given area over a given period.

Total pond harvest is accomplished by draining and seining. First, the pond is partially drained (20-30%) to concentrate the fish. After that, the pond is repeatedly seined until most (80%) of the fish are captured. The pond is then drained further, and the seining process is continued. From the findings of this present research work, it was estimated that the process of harvesting of fishes was done by the fish farmers and TVET students. It was found to be greatest for Female treatments (100%), followed by Male treatment (84.44%), and least for Control treatments (40%).

Overall skill scale through TVET education: The expected results of aquaculture skills from TVET education were calculated using a skill measurement sheet to compare both male and female students with fish farmers who usually do aquaculture practices. As per data collected by skill measurement sheet, a series of the indicator were measured, and the result shows that overall percentage is shown in the Figure-10.1. It was found that the overall performance was highest in Female treatments (99.8%), followed Male treatments (90.1%), and lowest in the Control treatment (56.2%).

Chart 10.1: Overall skill scale through TVET education



Source: Field Survey 2022

Benefit-cost analysis: At the end of the experiment, fishes were harvested and weighed, and the value of the fishes were estimated

based on local market price. Benefit-cost analysis of different treatments was done based on the prices of fertilizer used, fish seed, and the income from the sale or estimated value of tilapia fish. The following simple equation was used:

$R = I - (Fc + Vc + Ii)$ Where R, net return; I, total income from tilapia; Fc = Fixed costs, Vc = Variable costs, and Ii, interest on investments.

The prices of inputs and tilapia correspond to the Kushtia wholesale market prices in 2022 are expressed in Bangladesh Taka (BDT). The net benefit and benefit-cost ratio (BCR) were calculated using the following formula: BCR = (Total income/Total cost) ×100

Fish growth and yield parameters: Growth and yield parameters of tilapia are shown in Table 10.1.

Table 10.1: Fish yield parameters for different treatments

Species/yields parameters	Control	Male	Female
Individual stocking weight (g)	34.93	35.10	34.73
Individual harvesting weight (g)	121.41	140.92	186.18
Survival rate (%)	97.42	97.88	97.62
Individual weight gain (g)	86.48	105.82	151.45
FCR (%)	1.35	1.42	1.46
Net yields (kg^{-1} dec.)	3.94	4.60	6.06

Source: Field Survey 2022

Different treatments significantly affected the individual growth parameters and total yield of tilapia. There was no significant difference between treatments for survival rate. The harvesting

weight of tilapia is also highest for the female treatment, followed by the Male treatment, and lowest in the Control treatment.

Comparison of economic returns:

Increasing management practices with better knowledge and dedication increased gross economic returns in Female treatment. The highest benefit-cost ratio (BCR) was observed in Female treatment with a value of 79.08%. There was a significant difference in BCR with lowest in Control treatment (17.38%) and medium in Males (46.72%) and highest in Female treatment (79.08%).

Table 10.2: Comparison of economic returns

Items	Amount	Treatments		
		Control	Male	Female
Variable cost				
Pond preparation (BDT)	LS	135	135	135
Cow dung	Total Kg/Dec	66	66	66
Urea	Total Kg/Dec	22	22	22
TSP	Total Kg/Dec	44	44	44
Fish fingerlings	Total Nos./Dec	300	300	300
Fish feed	Total Kg/Dec	685	685	685
Fish harvesting (BDT)	LS	77	77	77
Subtotal (BDT)		1329	1329	1329
Financial returns				
Fish	Total Kg/Dec	13	14.5	17
Return (BDT)		1560	1950	2380
Benefit-cost ratio (BCR)		17.38	46.72	79.08

Source: Field Survey 2022

CONCLUSION

The knowledge base and practical skills of students (predominantly female youths) participating in TVET were quantified through this research program. The fisheries education provided by Fish Culture and Breeding Trade aims to increase human resources work for the private sector and small-scale commercial fish farmers with aquaculture knowledge and up-to-date practical skills, thereby contributing to the sector's inclusive growth and sustainable development. The female students showed the best performance in aquaculture practices. They understood that they would be able to involve themselves in the family aquaculture system and find gainful employment in the private sector.

Based on the findings of the study, the following recommendations are put forward: (a) More engagement of the students for further development; b) Extend fisheries curriculum from 16 to 134 institutions or as required; and (c) Introduces these skilled workforces to both private and public sector. However, through this research it is quantified that the female students are performing better than the male students. Further research is required to determine the factors influencing better understanding and practicing the fish culture in their homestead ponds.

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