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The Impact of Competency-Based Education and Learning Implementation on Technical Colleges Outcomes: Kuwait College for Technological Studies (CTS) Case Study

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Abstract

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Many colleges and training institutions have shifted to Competency-Based Education/Learning (CBE/L) after using the traditional time-credits approach. Students' achievements and progress are accumulated, not only by credit hours for theoretical knowledge but also, through demonstrating their practical competences.

In CBE/L, students are assessed based on their ability to perform specific tasks using the knowledge and skills (competencies) required for each task in their academic course, regardless of how long such progression might take. The traditional method of learning was time-based on course credits, which last for a specific period of time, and through which students are learning more theoretical knowledge than practical or applied knowledge and skills. This quantitative study was designed to establish whether CBE/L had a significant impact on students' achievements in knowledge and skills based on their college and marketplace assessments. It has also explored whether the CBE/L approach had a significant impact on employers' decisions to recruit CBE/L graduates in comparison with traditional credit-based graduates.

A survey targeting Kuwait major workplaces has been conducted online and 442 replies was received in addition to the utilization and analysis of archiving data from Kuwait College for Technological Studies (CTS), Kuwait Civil Services Commission (KCSC), and Kuwait Ministry of Higher Education (MOHE). CTS has also provided the researcher with a

large number of documents that show their planning, implementation, and follow-up processes, as well as their agreements with various workplace sectors and government entities.

After conducting the analysis for the survey's and archival data, the researcher concluded that CBE/L implementation at CTS had a significant impact in improving student's competencies that enables them to perform their entry-level job tasks and duties. Such improvements in CTS graduated competencies have increased major workplaces satisfaction, trust, and confidence in CTS graduates which have reflected in their shorter waiting for employment periods compared to graduates from CTS before CBE/L implementation.

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ABET	A Governmental Agency that Accredits Programs in Applied and Natural Science, Computing, Engineering, and Engineering Technology
AIEX	Awareness and Information Exchange Theme
CBWS	Competency Based Educ. / Learn. Benefits & Work Satisfaction Theme
CBE/L	Competency Based Education / Learning
CBE	Competency Based Education
CBME	Competency Based Medical Education
CBL	Competency Based Learning
CBT	Competency Based Training
CCCD	Coordination, Cooperation, and Curriculum Development Theme
CTS	College of Technological Studies
CIWC	CTS Instructors and Work Coaches Competencies Theme
CVET	Continuing Vocational Education or Training (after joining workforce)
DACUM	Developing a Curriculum
EFA	Explanatory Factor Analysis
EQUATE	Petrochemical Company
EGSP	External Stakeholders, Government, Society, and Parents Effects Theme
IVET	Initial Vocational Education or Training (that Prepares Individuals for the Initial Entry into Employment)
KCSC	Kuwait Civil Services Commission
KIPIC	Kuwait Integrated Petroleum Industries Company
KNPC	Kuwait National Petroleum Company
KOC	Kuwait Oil Company
KSE	Kuwait Society for Engineers

MOHE	Ministry of Higher Education
MOU	Memorandum of Understanding
OJT	On Job Training
OLCP	OLCP Programs Theme
PAAET	Public Authority for Applied Education and Training
PAOM	Public Authority of Manpower
PIC	Petrochemicals Industrial Company
PTC	Petroleum Training Center
RQ	Research Question
SMEs	Subject Matter Experts
VET	Vocational Education and Training
WCWC	Workplaces Collaboration with CTC Theme
WIDS	Worldwide Instructional Design System

CHAPTER 1: INTRODUCTION

Introduction

Competency-based education and learning (CBE/L) has a long history, spanning more than four decades. It has progressed over time from a primarily vocational educational approach to a more sophisticated, integrated, and intricate model. As Ford (2014) noted, "Competency-based education and training is not a new concept. It has evolved from early vocational education models to more robust and complex approaches to learning in higher education" (p. 2). Delorenzo and Battino (2010) further described this approach as an educational system in which "time is the constant and learning is the variable" (p. 18).

Many scholars have drawn similar conclusions about competency-based education and learning (CBE/L). Worthen and Pace (2014) characterized CBE/L as a performance-oriented, mastery-based, and individualized learning approach. This approach emphasizes the mastery of job-related tasks by ensuring students learn and apply the necessary competencies (knowledge, skills, and attitudes) to pass standard-based practical assessments. These assessments are designed to demonstrate students' ability to perform essential job tasks within their discipline using authentic applications of knowledge and skills in scenarios resembling workplace situations.

As Kwon (2009) observed, the accumulation of knowledge and skills is critical for the development of human capital. The learning process is central to acquiring the necessary knowledge and skills, which are vital to improving an organization's human capital. In a similar vein, Alan, Altman, and Roussel (2008) suggested that "general human capital is to be defined by generic knowledge and skill, not specific to a task or a company, usually accumulated through working experiences and education" (p. 20).

Many major organizations view human resources as their primary assets and prioritize investing in them. Workplace competencies were defined by Ewell (1984) as the application of knowledge, skills, attitudes, values, and behaviors (such as relationships with society). Competency-based curriculums were first introduced as part of course-based programs in higher education in 1962 by Robert Mager (Spady, 1977).

Traditional education is typically characterized by a credit-driven, time-based system where instruction is led by teachers according to standardized curriculums. Students are grouped according to age or grade and receive the same instruction simultaneously, assessed through standardized, timed testing.

McClelland (1973) emphasized the importance of "testing for competence rather than for intelligence" (p. 423), marking the origin of competency research and the emergence of the concept of competency-based learning. In much of the literature, the process of accumulating specific competencies to master a discipline has been the key driver of the CBE/L concept.

According to the Australian Government Industry Skills Councils (2015), competency involves the accumulation of knowledge, skills, attitudes, or values and their application according to workplace performance standards. This notion underscores the need for ongoing development of competencies even after joining the workforce. In other words, competency-based training not only enhances employees' knowledge, abilities, skills, and attitudes but also prepares them to achieve their organization's goals and aligns training and strategies with performance intervention.

According to the Kuwait Civil Service Commission (2010), yearly reports indicated that graduate students without prior experience were facing difficulties in securing jobs related to their discipline due to their lack of practical competencies.

To address this issue, the Kuwait College for Technological Studies (CTS) which was established in 1954 as a two years diploma college and then it started its baccalaureate programs over 12 years ago. It was the only college in Kuwait that adopted competency-based education and learning (CBE/L) at the beginning of 2010. By implementing this approach, CTS collaborated with various workplaces to develop new curricula aimed at producing graduates who are competent in all assigned tasks and duties. These graduates are expected to perform effectively at an entry-level once they begin their careers.

Previously, CTS graduated technicians who completed two and a half years of technical education programs. Starting in 2010, CTS expanded its offerings to include four-year bachelor's education programs in addition to the diploma program.

Koenen, Dochy, and Berghmans (2015) found that their study of 26 educational organizations in the Netherlands concluded that "CBE is emerging, and that the majority of the institutions designed their education through a mix of traditional and competence-based teaching and assessment methods" (p. 1). This highlights the evolving nature of educational approaches and the increasing adoption of competency-based teaching methods worldwide.

When accreditation bodies such as the Accreditation Board for Engineering and Technology (ABET) recognize and accredit a program in a university or college, it signals that the program meets rigorous academic and professional standards. Programs that achieve ABET accreditation gain recognition and credibility from educational and academic organizations worldwide. By the end of 2018, all nine disciplines at the Kuwait College for Technological Studies (CTS) were fully accredited by ABET, following nearly four years of competency-based education and learning (CBE/L) program implementation that began in 2013.

According to Educause Learning Initiative (2014), "for CBE to be fully incorporated into higher education, the value of CBE credentials must be widely accepted, both by

consumers (students and employers) and by providers (institutions and accrediting agencies)" (p. 2). This acceptance and recognition are critical for CBE programs to thrive and provide meaningful opportunities for students in their educational and career pursuits.

Although the Kuwait College for Technological Studies (CTS) is one of the nine colleges and institutions under the Kuwait Public Authority for Applied Education and Training (PAAET), it was the first educational institution in Kuwait to actively involve various employers from public and private sectors in providing on-site training for their students. This involvement also extended to engaging these employers in the curriculum development process due to the crucial role they play in shaping the future direction of technical education at the institution.

In line with this approach, many public and private sector organizations in Kuwait were invited to collaborate in creating and implementing the competency-based education and learning (CBE/L) program. These joint efforts aimed to develop academic curriculums that equip students with practical, hands-on skills and the necessary knowledge for each discipline (PAAET, 2018). Through this collaboration, CTS and its industry partners sought to enhance the quality and relevance of technical education, preparing students to excel in their chosen fields.

The objective of this case study is to determine whether the implementation of competency-based education and learning (CBE/L) at the Kuwait College for Technological Studies (CTS) has had a substantial impact on its graduates by providing them with the necessary knowledge and skills (competencies) that allow new graduates to successfully perform the required job entry tasks when they begin their careers.

As McNamara (2013) emphasized, the process of skills development within students' educational journey should consider the needs of employers and workplaces as an integral part of the college curriculum. To achieve this, CTS actively involved various employers and

workplaces from both public and private sectors, including government ministries, major industries, and the oil sector, in creating a task inventory database that included all tasks required in various technical disciplines, along with related knowledge, skills, and the tools or equipment needed to perform each task.

In their guide for writing functional competencies, University of Baltimore (2005) highlighted that the first checklist item in the evaluation criteria of functional competencies "contains specific information: what is done – action verb; to whom or what – object; to produce what – expected output; and using what tools, equipment, work aids, processes" (p. 23). This attention to detail ensures that the CBE/L approach at CTS is closely aligned with the demands and expectations of the workplace, ultimately enabling graduates to be well-prepared for their professional roles.

According to Harvard University's 2014 competency dictionary, when performing job tasks, newly employed graduates should apply the knowledge and practical skills they have learned, often relying on a trial-and-error approach while operating machines, tools, equipment, and software such as statistical process control (SPC) charts and analyses.

Additionally, the use of computers on the job will enable newly employed graduates to enter or retrieve the information necessary for completing job tasks while using various measurement tools such as gauges and micrometers. Furthermore, they should become proficient in using their work computer systems.

This approach emphasizes the importance of applying learned competencies and practical skills in real-world job settings, allowing graduates to adapt and excel in their professional roles.

The collaboration between CTS and various workplaces has led to the creation of specialized majors tailored to the needs of major oil industries in Kuwait. The refinery operations major emerged from the partnership between CTS and Kuwait National Petroleum

Company (KNPC), while the manufacturing engineering major was developed in cooperation with Kuwait Oil Company (KOC).

Students pursuing the refinery operations major and interested in working in KNPC oil refineries or petrochemical plants receive an allowance of 200 Kuwaiti Dinars ($666) per month as CTS students, in addition to signing contracts with KNPC for an extra allowance of 300 Kuwaiti Dinars ($1000) per month. As part of the curriculum developed collaboratively by CTS and KNPC, these students undergo training at one of KNPC's three large refineries, complementing their practical training at CTS workshops equipped by major workplaces.

Students opting for the manufacturing engineering major and aiming to work in KOC upstream oil exploration locations also receive similar allowances from KOC and attend on-site learning at oil exploration sites and oil reservoir locations. This study has revealed that all graduates from CTS's refinery operations and manufacturing engineering majors are promptly employed shortly after completing their programs.

1.1 The Author Past Engagement in Competency Based Training (CBT)

The author of this study was not involved in the implementation of CBE/L at CTS. However, their interest in the subject began during their participation in the implementation of competency-based training (CBT) for actual employees of Kuwait National Petroleum Company (KNPC). This involvement occurred as part of a corporate project known as "Individuals Development Planning," initiated in 1991 and lasting until the end of 1994. During this period, the researcher served as a Senior Specialist in the Career Development Corporate Department of KNPC.

The researcher's involvement in the competency-based training (CBT) project at Kuwait National Petroleum Company (KNPC) sparked a deep interest in the competency-based approach, motivating him to study the impact of the implementation of competency-based education and learning (CBE/L) at the College of Technological Studies (CTS). Upon

expressing this interest to CTS management, they welcomed the idea of conducting this dissertation to examine the impact of CBE/L at their college. They also recognized the significance of their decision to engage major workplaces in the curriculum development process. CTS offered support during the data collection process and facilitated connections with major employers who hire their graduates and had participated in joint efforts with CTS specialists to develop various curricula.

The researcher has secured approval from CTS Management to conduct this study using publicly available data without the need for anonymization. Consequently, the researcher has opted to explicitly identify CTS as the case study organization for the following reasons:

1. Official Approval: CTS is a government-owned institution, and its management has formally consented to the declaration of CTS as the case study for this research. This approval is documented in Appendix N.
2. Nature of the Data: The study focuses on educational methods and does not involve any social or personal data of individuals. The data comprises only numerical statistics derived from survey questionnaires targeting workplaces, as well as archival data and documents provided by CTS, which do not include any personal information about students or staff.
3. Identifiability: As noted in the introduction, CTS is the sole institution in Kuwait that has implemented competency-based education. Given this unique status, anonymizing the institution would be pointless since it can be easily identified.
4. Legal and Institutional Support.The researcher received data from CTS, the Ministry of Higher Education (MOHE), and Kuwait College of Technological Studies (KCTS). These government entities were cooperative, as mandated by Kuwait law No. 12/2020, Article 2. This law promotes the freedom of information

circulation and the right to access such information, enhancing transparency and integrity in administrative and economic transactions, thereby fostering trust in governmental decisions (KIPIC, 2024, p.1). Additionally, Esmiran (2022) highlighted in his article on the Kuwait official news agency (KUNA) website that Article 2 of law 12/2020 ensures every individual's right to access and obtain information held by public entities.

1.2 Problem Definition Statement

The Kuwait Civil Service Commission (2010) reported that 19.55% of graduates from traditional colleges face challenges finding jobs in their respective fields. Employers have attributed their reluctance to hire recent graduates to these individuals' lack of practical experience and competencies. As a result, when graduates from traditional colleges enter the workforce, they often struggle to perform basic tasks related to their disciplines due to their limited practical technical knowledge and skills (competencies).

Armstrong (2009) noted that job descriptions tend to prioritize tasks over outcomes and focus more on duties rather than the competencies required to perform them (both technical competencies, encompassing knowledge and skills, and behavioral competencies). In response to these challenges, colleges are exploring practical solutions to help their graduates acquire the necessary skills and competencies.

However, developing curricula without involving key stakeholders, such as major industrial firms and government bodies, in the process may have led to a decrease in employer confidence in the graduates from traditional technical colleges. Al-Jubran, (2020) argued that curriculum development is a set of processes that involves various academic and professional stakeholders, who are experts at identifying required competencies of the graduates. Similarly, Matković, Tumbas, Sakal, and Pavlicevic (2014) indicated that

"Curriculum development is a complex and iterative process with a great number of activities that involve many stakeholders." (p.1).

This suggests a potential disconnect between educational institutions and workplace requirements, highlighting the need for greater collaboration to bridge the gap.

1.3 Purpose of the Study

The research aimed to evaluate whether the implementation of Competency-Based Education and Learning (CBE/L) at The College of Technological Studies (CTS) significantly impacted students' ability to gain competencies that allowed them to effectively perform required job entry tasks upon entering the workforce. The study also assessed whether the competency level reached by CTS graduates during their studies led to a noticeable difference in workplaces' acceptance of these graduates compared to those who completed their education under the traditional approach.

Furthermore, the research investigated the role of engaging different stakeholders, including major industrial firms and government bodies, in the curriculum and competency development process. This engagement was explored to understand whether it contributed significantly to improving the focus and quality of the programs. Through this analysis, the study aimed to shed light on the broader impact of CBE/L and stakeholder collaboration on educational outcomes and workplace readiness.

1.4 Research Questions

This case study is centered on exploring how the implementation of Competency-Based Education and Learning (CBE/L) at The College of Technological Studies (CTS) impacted the provision of required competencies to students. To guide the study and achieve its objectives, the researcher formulated one main research question and six sub-questions derived from the problem statement and the study's purpose:

The Main Research Question: To what extent does the implementation of CBE/L at CTS impact the provision of required competencies to students?

To answer the main research question and achieve the objectives of the study, the following six research sub-questions were constructed:

1. How effective was the CTS awareness campaign in educating workplaces, students' parents, and the general society about the anticipated benefits of CBE/L and gaining their support, as well as that of governments and legislators?
2. To what degree was there preparation, cooperation, and collaboration between CTS and workplaces to improve the likelihood of successfully implementing a CBE/L program?
3. Did the involvement of workplaces in curriculum development enhance employers' confidence in CTS graduates' competencies and increase their acceptance of CTS graduates?
4. How effectively did on-site practical learning opportunities provided by workplaces supply CTS students with the necessary knowledge and skills (competencies) that make employers more confident in CTS graduates and increase their acceptance?
5. To what extent did the implementation of CBE/L at CTS improve CTS graduate competencies required for performing entry-level technical tasks and increase workplaces' approval of their employment?
6. How much did workplaces accept CTS's CBE/L programs, and did this increase their confidence and satisfaction with CTS graduates after the CBE/L implementation?

The researcher selected the research questions in this sequence due to the interconnectedness of the topics and the logical progression of the research. Many educational institutions are hesitant to implement significant changes to their educational

approach, preferring to wait for other organizations to take the lead because decision-makers may fear being held responsible if the changes are unsuccessful. Consequently, CTS and PAAET prioritized building trust and confidence among all concerned stakeholders and within CTS itself as the initial step in this process.

Consequently, although earning the trust and confidence of legislators, the community, parents, students, and workplaces was a challenging task, CTS and PAAET management considered it crucial to achieve this goal before proceeding with the CBE/L implementation. This consideration led to the formulation of the first research question.

CTS and PAAET understood that involving and cooperating with various workplaces from the beginning of the planning process was crucial for fostering future collaboration between CTS and workplaces, thus increasing the likelihood of successfully implementing CBE/L. This understanding led to the development of the second research question. The relationship between RQ1 and RQ2 is clear: to gain the trust and confidence of stakeholders such as workplaces, it was essential to involve them in the decision-making, planning, and implementation processes and treat them as business partners rather than merely clients.

One of the primary aspects of engaging workplaces with CTS was their active involvement in curriculum development. This collaboration aimed to boost employers' confidence in CTS graduates' competencies and improve their acceptance of CTS graduates. This goal led to the establishment of RQ3.

After establishing the relationship between RQ1 and RQ2, the connection between RQ3 and RQ2 becomes evident. To clarify this relationship, it is important to highlight that to gain stakeholders' trust and confidence (RQ1), CTS needed to foster and support its cooperation and collaboration with Kuwait's various workplaces (RQ2). The most effective way to build this cooperation and collaboration, thereby earning stakeholders' trust and confidence, was by involving them in the curriculum development process (RQ3).

Another example of cooperation and collaboration between CTS and various Kuwaiti workplaces (RQ2) was the involvement of workplaces in the on-site practical learning process offered to CTS students. This collaboration provided students with the necessary knowledge and skills (competencies), giving employers greater confidence in CTS's outcomes and increasing their acceptance of CTS graduates (RQ4).

By involving workplaces in the on-site practical learning process for students to learn how to perform job entry tasks (RQ4), the practical education endorsed through CBE/L implementation significantly impacted CTS graduates' competencies required for performing job entry technical tasks. This, in turn, increased workplaces' approval of their employment (RQ5).

This increase in workplace confidence in graduates who have gained their competencies on workplace sites (RQ5) has led to a higher acceptance of CTS CBE/L program graduates and has improved workplace satisfaction with CTS graduates after the implementation of CBE/L (RQ6).

An awareness campaign was launched to increase trust and confidence in the implementation of CBE/L (RQ1). To further boost trust, cooperation and collaboration between CTS and workplaces were established to enhance the likelihood of successful CBE/L programs (RQ2). This collaboration and cooperation were achieved through two main workplace engagements in the education process: the first was through workplace involvement in the curriculum development process (RQ3), while the second major engagement was through workplaces' role in facilitating on-site practical learning (RQ4).

This on-site practical learning, based on joint efforts and curriculum development, significantly improved CTS graduates' competencies, enabling them to perform required job entry technical tasks and increasing workplace approval of their employment (RQ5). Such

improvements in graduates' practical knowledge and skills (competencies) have increased workplace satisfaction with the CBE/L education approach (RQ6).

The researcher highlighted that although CTS was established in 1954, there was no significant change in employers' acceptance rates, employment waiting periods, or graduate numbers until 2014. This shift coincided with the graduation of the first cohort of CBE/L students who had enrolled in 2010. As the percentage of these students increased over the following years, the overall waiting period for employment decreased, and the demand for CBE/L graduates, particularly in the oil and gas sector, increased.

Additionally, as mentioned in the first chapter, CTS is a government-owned educational institution and one of the nine colleges and institutes under the Public Authority for Applied Education and Training (PAAET). It adheres to Kuwait's policy of replacing expatriates with skilled Kuwaiti employees, particularly in the public and oil sectors. This policy was initiated in 2000 with the passage of a law aimed at "National Labor Support and Encouraging them to work in Non-Governmental Bodies." Notably, Article 2, Section 14 of Law 19 of 2000 states: "To propose policies related to adjusting the structure of manpower in a manner leading to the implementation of plans for replacing expatriate manpower with national manpower to the extent possible" (KMOF, 2000, p.3).

1.5 Significance and Impact of the Study

This study has contributed to the existing knowledge in the field of practical education and learning by offering future researchers an empirical examination of competency-based education and learning (CBE/L). It has furnished technical colleges and scholars in higher education with valuable insights into the advantages of CBE/L programs, particularly in enhancing students' practical skills. Moreover, it has shed light on the impact of adopting innovative educational methods on employers who were actively involved in the program development process.

The researcher's aim is to provide a practical case study of a college that has implemented Competency-Based Education and Learning (CBE/L). This case study could influence colleges considering or already committed to implementing the CBE/L approach by offering insights into a successful implementation. Therefore, the study serves as both a motivational experience and an additional resource, educating college decision-makers about the potential advantages of CBE/L in enhancing students' practical competencies and boosting their acceptance rates by employers. Furthermore, the study highlights various success factors that may have played a key role in facilitating the implementation of CBE/L at CTS.

The findings of this study could serve as a driving tool for CBE/L project teams, demonstrating that not only has the University of New Hampshire, a pioneering institution in the US, successfully implemented CBE/L, but there is also another success story from Kuwait with its implementation at CTS.

The researcher has investigated the differences in CTS graduates' competencies following the implementation of competency-based education and learning (CBE/L). This empirical study compared the outcomes of students who graduated using the traditional credit-based approach with those who graduated more recently through the CBE/L program. Furthermore, the study analyzed a variety of research on CBE/L, providing insights from different angles and perspectives.

The study aimed to determine whether the adoption of competency-based education and learning (CBE/L) significantly enhanced the ability of CTS graduates to competently perform the necessary job tasks required by major industrial employers in Kuwait.

The researcher explored whether involving different stakeholders in the development process of program curricula and competencies was significant and assessed whether such participation increased employers' confidence in CTS outcomes. Additionally, the study

outlined the measures CTS implemented to improve the likelihood of successful competency-based education and learning (CBE/L).

1.6 Research Design

This case study employed a quantitative approach, utilizing an instrument development process and a survey questionnaire. Coy (2019) noted that quantitative inquiry is often controlled and operates within a well-defined context, seeking to generate raw data scores and using statistical analysis to identify a numerically average experience. Meanwhile, Greener (2008) argued that quantitative research is typically associated with a deductive approach to test theories, often operating within a positivist or post-positivist paradigm with objective views on the phenomena under study. Greener (2008) also highlighted that the use of quantitative research enables the researcher to anticipate the influence of data collection and analysis tools on the research design, understand the types of data available for analysis, use computer coding for data processing prior to analysis, and select appropriate methods to present data using diagrams, charts, and tables with descriptive and inferential statistics. Moreover, the study facilitated the choice of suitable statistical tools for the identified research variables.

The researcher adopted a post-positivist paradigm for this study, considering it the most suitable approach. This choice allowed the researcher to employ the quantitative approach with a degree of flexibility, enabling a research process guided by reasoning and common sense while avoiding bias. Kaushik and Walsh (2019) asserted that the use of post-positivism allowed the researcher to apply scientific reasoning and everyday common sense in a consistent manner.

They further emphasized that post-positivism, one of the older approaches in social research, is often linked with quantitative methods and formal rhetoric that emphasize precision, generalizability, reliability, and replicability. This approach views inquiry as a

series of logically connected steps and establishes knowledge claims based on objectivity, standardization, deductive reasoning, and control within the research process (Creswell 2013; Creswell & Clark 2017).

The researcher evaluated the impact of the Competency-Based Education/Learning (CBE/L) program implementation from the perspective of workplaces and archival data specifically for the College of Technological Studies (CTS) in a single case study. Yin (1984) supports the use of single case study methods for critical cases, while Robson (1993) described a case study as "a strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon within its real-life context using multiple sources of evidence" (p. 146). The focus on a single college was chosen due to the critical nature of the subject, which required a comprehensive investigation, and because CTS is the only post-secondary college implementing CBE/L in Kuwait. Conducting a study in an alternative or additional country was not feasible within the researcher's capabilities.

The researcher conducted an instrument development process targeting subject matter experts (SMEs) who participated in focus groups. The goal of this process was to utilize the expertise of the SMEs to develop questions for the research questionnaire, thereby enhancing its validity and reliability.

The researcher conducted a survey targeting major public and private sectors that typically employ CTS graduates. The questionnaire aimed to assess whether these workplaces observed a significant difference in the competencies of students who graduated in the past three years using CBE/L compared with those who graduated through traditional education.

The survey also explored whether the rate of acceptance of CTS graduates by various employers has changed since the implementation of CBE/L. Finally, it assessed the

effectiveness of employers' involvement in developing CBE/L curriculums and providing on-site training for CTS students.

The researcher used archival data provided by The College of Technological Studies (CTS) and the Kuwait Civil Services Commission (KCSC). The data spanned from 2012 to 2019 and included the number of graduates, grades, graduation dates, and employment dates. Additionally, a smaller set of data concerning the numbers of CTS graduates between 2012 and 2019 who continued with their higher education programs was provided by the Kuwait Ministry of Higher Education (MOHE).

The researcher delved into a substantial volume of documents provided by CTS to gain insights into the planning, implementation, and monitoring of CBE/L, as well as the agreements forged with different workplace sectors and government entities. These documents also shed light on CTS's achievement of ABET accreditation for all its majors or programs.

1.7 Data Collection Methods

A quantitative approach has been used to collect the data needed to demonstrate whether students graduating using CBE/L have gained the required applied knowledge and practical skills and whether such an approach has contributed to providing CTS graduates with a better chance in the marketplace.

Data has been gathered from the 7-point Likert scale quantitative survey that has been coded into a numerical representation. The first group of data has been gathered from the survey, which was targeting major public and private sectors that usually employ CTS graduates. Different CTS documents and archived data from CTS, KCSC, and MOHE have also been utilized. The researcher thoroughly examined an extensive array of documents provided by CTS to gain insights into the planning, execution, and monitoring of CBE/L by PAAET and CTS. These documents also shed light on the agreements forged with diverse

workplace sectors and government entities. Furthermore, they elucidated how CTS successfully secured ABET accreditation for all its majors or programs.

1.8 Data Analysis Methods

As a quantitative study, this research involved the collection and analysis of quantitative data. Both descriptive and inferential data analysis methods were employed. The descriptive analysis provided insights into the frequencies and percentages of responses to all survey questions, offering an overview of the data collected. Inferential analysis was conducted to assess whether a significant development occurred in the accumulated competencies of students who graduated before and after the implementation of CBE/L. Additionally, this analysis highlighted the significance of employers' acceptance of CBE/L graduates compared to traditional graduates.

Data analysis in this study included the use of various statistical tests such as Skewness and Kurtosis, Kolmogorov-Smirnov, and Shapiro-Wilk methods to assess the distribution parameters of the data, including normality, uniformity, and exponential distribution. Furthermore, Chi-square, Kruskal-Wallis, t-test, and ANOVA were utilized to identify significant differences in sample means, which helped determine if the implementation of the CBE/L approach had a substantial effect. These statistical tests provided a comprehensive analysis of the data to evaluate the impact of CBE/L implementation at CTS.

Before conducting any of the descriptive and inferential tests mentioned, the researcher performed a comprehensive development process to identify the constructs, assess the internal consistency of the data, and validate the instrument's items or questions. This step was crucial in ensuring the reliability and validity of the data collected through the survey questionnaire and other instruments. By assessing internal consistency, the researcher

aimed to guarantee that the data accurately represented the constructs being studied, providing a strong foundation for the subsequent analysis.

The researcher thoroughly examined an extensive array of documents provided by CTS to gain insights into the planning, execution, and monitoring of CBE/L by PAAET and CTS. These documents also shed light on the agreements forged with diverse workplace sectors and government entities. Furthermore, they elucidated how CTS successfully secured ABET accreditation for all its majors or programs.

1.9 Dissertation Delimitations

The scope of this study has been narrowed to the following delimitations:

- Examining the impact of CBE/L on students' practical and cognitive knowledge: The study evaluates whether the implementation of competency-based education and learning (CBE/L) at the College of Technological Studies (CTS) has significantly enhanced students' practical and cognitive knowledge, as well as their applied skills.
- Assessing employers' confidence in CTS graduates: The study investigates whether the implementation of CBE/L has improved employers' confidence in CTS graduates during their recruitment and selection processes. This involves determining whether employers find the graduates to be better prepared and more capable of performing job tasks effectively.
- Examining the impact of stakeholder engagement in curriculum development: The study explores whether the engagement of different stakeholders, such as major industrial firms and government bodies, in the development process of curriculums and competencies, has increased employers' confidence in CTS graduates. This includes evaluating whether the involvement of these

stakeholders in program development leads to more relevant and practical educational outcomes for students.

- While this research study has focused on evaluating the impact of competency-based education and learning (CBE/L) at the College of Technological Studies (CTS) on students' knowledge and skills, as well as employers' confidence in graduates, certain methodological details and additional dimensions have not been explored to keep the study's scope focused and manageable.
- Detailed Process of DACUM Analysis Method: Although the study acknowledges the use of DACUM analysis in a joint workshop by CTS and employers to identify the required competencies for various programs, it does not delve into the detailed process of this analysis method. Eastern Kentucky University (2017) established that DACUM (Developing A Curriculum) is a well-established method for designing competency-based curriculums by analyzing the tasks and duties required in a particular job role. However, the study's focus is more on the overall impact of CBE/L rather than the intricate details of curriculum development.

- Gap Analysis of New Graduates' Practical Competencies: The study does not include a discussion of how gap analysis is conducted to assess new graduates' practical competencies. Gap analysis is a process that uses the outcomes of DACUM analysis, front-end analysis, or hierarchical cluster analysis to identify gaps between the expected and actual performance of graduates. This process involves complex methodologies that are not directly related to the primary research interest of this study.
- Competency-Based On-The-Job Training (OJT): The research does not explore the dimension of competency-based on-the-job training (OJT), as it requires a

comprehensive investigation that would broaden the scope of the study. OJT is an important aspect of competency development and involves practical training in the workplace to reinforce and apply learned competencies.

By limiting the scope to the core objectives of assessing the impact of CBE/L implementation at CTS, the study ensures a more focused investigation while acknowledging the potential for future research in these additional areas. The essential terms are CTS, CBE/L, knowledge, skills, competencies, tasks, duties, employers, workplaces, gap analysis, DACUM analysis and OJT.

1.10 Dissertation Structure

Chapter 1 provides the background and an overview of the College of Technological Studies (CTS)'s initiative to implement competency-based education and learning (CBE/L) several years ago. This chapter sets the stage for the research study by outlining the context and the significance of CTS's adoption of the CBE/L approach.

Chapter 2 offers a comprehensive review of academic literature that covers relevant subjects and themes associated with the implementation and impact of CBE/L. This chapter discusses different perspectives, interpretations, and research on the issues related to CBE/L and examines the various methods, concepts, theories, schemes, and models that have been utilized in studying similar topics.

Chapter 3 on the other hand, describes the research methodology and design, linking the research questions and objectives with the data collected and the methods used for analysis. This chapter provides details about the research instruments, data collection processes, and data analysis techniques applied in the study.

Chapter 4 presents the findings, evidence, and analyzed information gathered from the survey questionnaire and other data sources. This chapter compares, explains, and discusses

the tested data and its actual outcomes, highlighting any patterns or trends identified in the collected data.

Chapter 5 concludes the study with a summary of the research findings, along with recommendations based on the study's outcomes. It also identifies potential areas for future research that could further explore the impact of CBE/L at CTS and other related topics in the field of education and workforce development.

CHAPTER 2: LITERATURE REVIEW

Introduction

The transition to competency-based education and learning (CBE/L) presents a significant shift for educational institutions such as the College of Technological Studies (CTS) in Kuwait. This change involves transforming CTS from a traditional time- and credit-based educational institution to one that adopts a more flexible, outcome-focused approach in line with the CBE/L method. This chapter outlines the themes and key aspects of competency-based education and learning and discusses their implications.

Through this study, the researcher evaluates whether CBE/L is an effective educational method and a viable solution for addressing the challenges faced by recent graduates who lack practical technical competencies. By exploring the impact of CBE/L on graduates' ability to find suitable employment in their fields of study, the study aims to determine whether CBE/L offers a reliable path to bridging the gap between academic preparation and workforce demands. Through this evaluation, the researcher aims to provide insights into the potential benefits and challenges of implementing CBE/L in similar educational institutions.

2.1 Concepts of CBE/L

One of the central principles of competency-based education and learning (CBE/L) is its emphasis on teaching and learning the specific skills and knowledge necessary to master all required competencies and perform relevant job tasks. In CBE/L, each academic major or discipline is composed of a set of competencies that students must achieve to graduate. Instead of adhering to a rigid time-based curriculum, students work at their own pace to acquire and demonstrate mastery of these competencies.

Eraut (2003) defined an individual's competency as "the ability to perform the tasks and roles required to [meet] the expected standards" (p. 117). This definition highlights the outcome-oriented nature of CBE/L, where the focus is on ensuring that students achieve a high level of performance in tasks relevant to their chosen fields. Through this approach, CBE/L aims to produce graduates who are well-prepared to excel in their professional roles and contribute effectively to the workplace.

McClarty and Gaertner (2015) emphasized that competency-based education (CBE) operates with flexible time frames: "The standards for demonstrated learning are held constant, but the amount of time students must spend to reach them can vary" (p. 1). In CBE, students do not pass any subject unless they can show their capability in performing the tasks related to that subject. This requires students to master the competencies associated with those tasks.

McClarty and Gaertner (2015) also argued that institutions offering CBE can enhance the value of this model by providing robust and clear evidence to education administrators, regulators, and workplaces that their graduates have mastered the necessary practical competencies. Demonstrations of this mastery allow students to prove their ability to successfully complete various work-related tasks with accuracy and within given time constraints. This evidence-based approach supports the credibility and effectiveness of CBE and aligns educational outcomes more closely with the needs of employers and the demands of the workplace.

In competency-based education and learning (CBE/L), assessments are conducted using gap analysis to ensure students have mastered all necessary competencies before progressing to the next level. Students are required to demonstrate their skills practically, proving their knowledge and abilities in a specific subject area.

According to Gibbs, Slevitch, and Washburn (2017), competency-based training (CBT) assesses a participant's capability to demonstrate knowledge, skills, and attitudes under certain conditions, correlating with individual performance on the job. The participant's performance is measured against industry benchmarks and standards, rather than being compared to the achievement of other students.

Therefore, competency-based learning focuses on mastering required skills using associated knowledge. Wu (2013) suggests that CBT can be an effective tool for developing employees' competencies, which are directly related to on-the-job performance. This can lead to improved employee performance, enhanced customer satisfaction, and overall better organizational performance. By emphasizing practical skills and applied knowledge, CBE/L aims to better prepare students for their professional roles and meet industry standards and expectations.

Competency-based education and learning (CBE/L) emphasizes an outcomes-based approach, focusing on students' mastery of task competencies as the core of the learning process. In this approach, students demonstrate their abilities through performance rather than traditional exams, ensuring they have the knowledge and skills necessary to perform specific tasks. Competent students are the desired outcome of competency-based learning.

The National Vocational Qualification (NVQ) views CBE/L as an outcomes-based behavioristic approach, centering on assessment processes and the students' ability to successfully demonstrate their skills and competencies. This emphasis on applied, hands-on learning and demonstrated mastery of tasks prepares students to meet real-world job demands and industry standards, providing them with the foundation to excel in their professional roles (Mulder, Weigel, & Collins, 2007).

Establishing competency-based education and learning (CBE/L) requires a structured approach to allocate the necessary competencies for each job task. One method educational

institutions can use to define the required tasks and competencies is conducting an occupational job task needs analysis for each job or discipline. A widely recognized approach for performing this type of analysis is DACUM analysis (Developing a Curriculum).

DACUM analysis involves assembling a group of experts to identify and validate all tasks performed by employees in the targeted job. This process includes outlining the tasks, knowledge, skills, and traits necessary for success in performing a given job. The knowledge and data gathered during the analysis are guided by key principles such as facilitation, agreement building, and the tenets of competency-based education (Norton & Moser, 2008).

By conducting a comprehensive DACUM analysis, educational institutions can ensure that their CBE/L programs are closely aligned with industry standards and workplace needs, ultimately providing students with the practical competencies and skills required to excel in their chosen professions.

2.1.1 CBE/L vs Vocational Education or Learning

While CBE/L is designed to provide education at a post-secondary level (university or college), Vocational Education and Training (VET) could be either directed as a preliminary education or training for entry level employees or as a continuous training for employed personnel. Grubb and Ryan (1999), indicated that the VET approach is adopted by many organizations for four main purposes:

1. Prepare pre-employment staff applying for entry-level jobs with the required training to perform specific work. In many countries, these training VET centers or schools are operated or funded by national education or labor ministries. Passing such training is a condition for completing employment.
2. Provide existing staff with retraining programs, either to sharpen their skills or due to the introduction of new or complex technology or machinery.

3. Offer individuals who have lost their jobs new competencies so they can gain skills necessary to secure new employment or provide other individuals looking for new careers with the necessary training to meet employment requirements.
4. VET can also serve as a solution not only for training purposes but also to provide professional education degrees to those who have been out of the labor market for an extended period. VET can also help individuals without prior professional experience gain skills for employment. Many of these individuals have relied on public aid for their income (Grubb & Ryan, 1999).

Similarly, Cedefop (2008) argued that Initial Vocational Education and Training (IVET) is a form of general or vocational education and training provided either as part of the initial education system, before entering the workforce, or after starting working life. IVET serves as entry-level training for employees. The author explained that IVET can be conducted as full-time school-based education and training or as a retraining process for working staff. Cedefop (2008) defined Continuous Vocational Education and Training (CVET) as the area of education or training that follows employment and aims to: (a) improve or update employees' knowledge and/or skills; (b) acquire new knowledge and skills for career development purposes; and (c) continue developing personal and professional capabilities for potential job promotion or future occupations.

2.2 CBE/L Characteristics

Sturgis and Casey (2018b) described the characteristics of CBE/L as a process that focuses on academic knowledge, transferable skills, and the ability of students to become lifelong learners. They noted that culture, pedagogy, and structures are designed to develop student agency, build foundational academic knowledge, and engage students in deeper learning (p. 15). Dumciene, Saulius, and Capskas (2016) observed that working students attend more CBE/L courses and value this method more than non-working students. Non-

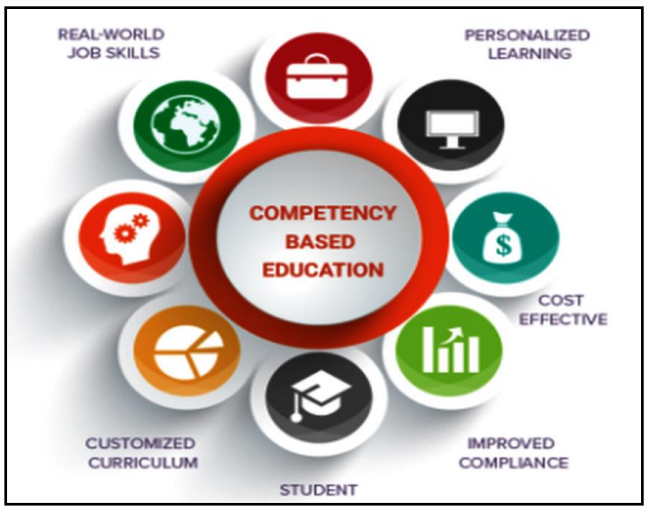
working students tend to prefer traditional lectures more than working individuals, and blended learning is even more acceptable to them since the CBE/L approach relies heavily on the utilization of e-learning methods, which is more convenient for working students.

Dumciene et al. (2016) noted that, according to their survey, the majority of competency-based learning (CBL) students believe that the study materials presented in CBL are relevant to the competencies they aim to acquire. They also believe that CBL is more focused in terms of quality, scope, and requirements than traditional approaches.

As shown in Figure 1, although all CBL graduates from a specific discipline acquire the same required competencies, each student uses their own unique pathway to achieve them. This is why competency-based education and learning is considered to be more personalized than traditional approaches.

Figure 2.1

Complete Support for Competency-Based Education. Adapted From Creatrix Campus (2017).



According to the study by Dumciene et al. (2016), more than half of the respondents believed that there is a significant difference between the competencies acquired via e-learning and those acquired via traditional learning. One advantage of traditional learning is

the direct interaction between instructors and students, as well as the availability of tangible learning materials that traditional students can utilize in the classroom, labs, and workshops.

Therefore, while e-learning plays a significant role in CBE/L, there are some competencies that necessitate traditional learning in the lab or workshop, particularly those involving complex engineering skills such as mechanical maintenance, electrical calibration and load balancing, concrete and steel reinforcement, and similar hands-on tasks.

Dumciene et al.'s (2016) study reported significant differences in the attitudes of students attending university e-learning courses compared to those in traditional studies in terms of professionalism, quality, and efficiency. CBL emphasizes an individual's ability to perform a task using their knowledge, skills, abilities, behaviors, and attitudes. Many studies have found CBL to be an effective training method in both the public and private sectors. Filling an employee's skills gaps is achievable through specially designed training programs focusing on knowledge, skills, and abilities.

Organizational performance is closely tied to the abilities of its employees in performing their required tasks. Vathanophas and Thai-Ngam (2007) stated that employees need to consider their employer's job requirements and the specific competencies these roles demand. These competencies are a clear indication of an individual's ability to perform their job-specific tasks effectively.

2.3 Including CBE/L as Part of Strategic Planning

Educational organizations that plan to implement competency-based education and learning (CBE/L) need to incorporate this initiative into their strategic plans. By doing so, these organizations can ensure the success of the initiative and provide the necessary support. According to the Competence Based Education Network (2017) report, the first principle emphasizes that institutions should "strategically identify and secure the commitment of

multiple external partners to inform and support the achievement of their CBE programs' purpose and their institutional equity goals" (p. 25).

The report also outlined how these strategies involve engaging all relevant internal and external partners in the process of designing, delivering, and evaluating the competency-based education and learning (CBE/L) programs adopted by educational institutions. In complex environments, education specialists may sometimes overlook the importance of establishing educational strategies for their organizations.

Wu (2013) provided several recommendations for the knowledge needed during strategic planning for implementing competency-based education:

(a) Identifying key motivators of high performance in the public sector.

(b) Recognizing high-performing public officials and understanding their attitudes.

(c) Assessing the training needs of various individuals.

(d) Developing training programs to address specific competency gaps in individuals.

(e) Creating a training plan that supports self-directed learning.

Similarly, in its yearly report, the Thailand Office of Civil Service Commission (2014) stated that part of the Thai government's education strategy is to adopt a competency-based approach in human resource management for public sector organizations committed to human resource development strategic plans grounded in the competency-based approach. Jones and Voorhees (2002) argued that, for competencies to be effectively utilized, strategies must be developed to ensure standardization and important decisions regarding the improvement of student learning processes should rely on competency-based education and learning (CBE/L) assessment results. Meanwhile, Vathanophas and Thai-Ngam (2007) observed that "improving employee competencies would enhance both job and organizational

performance, and organizations need to develop the competencies of individual employees to support a competitive strategy" (p. 3).

2.4 The Role of Technology in CBE/L

Online learning is an integral component of the theoretical part of competency-based education and learning (CBE/L), and technology serves as one of the key factors for successful implementation. It has been a part of modern education for over two decades, with the level of technological utilization varying across institutions.

Some colleges incorporate more technology into their students' learning processes, believing it provides students with the ability to deepen their knowledge foundation and enhance their classwork. Coleman, Gibson, Cotton, Howell-Moroney, and Stringer (2016) indicated that a low level of computer integration could be due to external obstacles such as an insufficient number of teachers and lack of student training, limited availability of computers, and inadequate technology integration. Access to the internet can present significant challenges for students, teachers, and the overall education process.

Liu (2012) emphasized the development and utilization of multimedia as part of the mathematics curriculum to enhance students' cognitive learning processes, improve their math scores, and increase classroom participation. Integrating technology into various aspects of education is considered a significant change that should be embraced by all stakeholders involved in the education process. On the other hand, Chauhan (2017) noted the importance of establishing a foundation for technology integration in education, which results from collaboration among different stakeholders in the school community. This collaboration reflects a shared vision of the importance of utilizing technology in education.

Coleman et al. (2016) found that integrating technology into the education process is not an easy task and requires careful planning, training, and execution. Although their research findings demonstrate the benefits of computer usage in the classroom for both

students and teachers, they noted that it is challenging to integrate technology throughout the curriculum.

Teachers' positive attitudes toward integrating technology into the education system play a significant role in its success. Cheng, Lou, Kuo, and Shih (2013) found that studies on the issue of integrating information technology into the teaching process showed an increase in teachers' positive responses to applying digital game-based learning (DGBL) in their educational practices.

On the other hand, technology integration in educational processes has encountered several technical and procedural challenges, especially with mobile devices. Similarly, Lewis (2016) noted that many technical and educational challenges have been experienced during the integration of mobile devices as part of the curriculum.

2.5 CBE/L Assessment and Evaluation Process

Some studies have described competency-based education and learning (CBE/L) assessment as a complex process. "Transferable skills are the adaptive expertise and abilities that enable people to effectively perform roles, complete complex tasks, or achieve specific objectives" (Sturgis & Casey, 2018b, p. 34). Students must be assessed by demonstrating their expertise and showing that they have mastered the targeted competencies by performing their related job tasks. The complexity lies in the fact that some of these tasks are complex, multistage tasks that require the use of transferable knowledge, skills, and experiences imparted by their teacher, faculty, trainer, or a simulator. Assessments can range from short, simple technical activities to longer, more complex tasks or multi-phase projects.

2.5.1 Student Assessment

Voorhees (2001) explained that competencies are accumulated through the integration and interaction of knowledge, skills, abilities, and learning experience. This interaction forms learning packets or bundles of competencies that are necessary for performing a task.

Therefore, the key assessment method for competency-based education and learning (CBE/L) involves students physically performing each task related to the learned competencies and demonstrating it in front of the assessor. Lopez, Patrick, and Sturgis (2017) argued that a competency-based learning system offering personalized pathways for students to meet learning goals requires educator capacity to evaluate student learning using multiple forms of evidence against common standards and expectations (p. 43).

Recognizing competent students, trainees, or employees involves observing and evaluating their ability to effectively perform job tasks using the knowledge, skills, and attitudes they have acquired. A competent person demonstrates proficiency, accuracy, and efficiency while performing tasks, requiring minimal supervision and completing work within a reasonable time frame using the necessary tools and equipment.

According to Vathanophas and Thai-Ngam (2007), "competency encompasses the knowledge, skills, abilities, traits, and behaviors that allow an individual to perform a task within a specific function or job" (p. 2). Competent employees contribute significantly to an organization's success by enhancing its performance and providing a competitive advantage over its competitors. These individuals can adapt to various challenges, make informed decisions, and exhibit problem-solving abilities that drive organizational growth and innovation.

The focus on the ability to "perform" tasks is central to assessing competency. When an employee or student demonstrates mastery of competencies by successfully performing related tasks, they can be evaluated as competent. McCarthy and Garavan (2001) found that competency-based assessment and feedback is now a common practice in workplaces, serving as an organizational development tool for learners. Brumm, Mickelson, Steward, and Kaleita (2006) reported that Iowa State University used two assessment tools for its competency-based agriculture bio-engineering program.

The first tool was an online computer assessment simulator that measured students' competencies, and the second tool was an online assessment system used to create students' electronic portfolios. Each portfolio contained the competencies required for graduation and indicated the student's progress in accumulating the necessary competencies. This combination of assessment methods provides a comprehensive view of students' abilities and development.

Employers can assess the competencies of individuals who join the workforce after graduation by conducting yearly evaluations of their competency development and progress. This assessment helps identify any existing gaps and determine further on-the-job or external training needs. Ennis (2008) emphasized that using a competency-based performance appraisal system to properly assess and evaluate employee performance provides a structured approach to guiding appropriate training and career development opportunities. Integrating this assessment process into the organization's practices ensures that employees receive the support and resources they need to continue growing in their roles and contribute effectively to the organization's success.

2.5.2 Educators/Instructors/Faculty Assessment

The assessment process for competency-based education and learning (CBE/L) educators and instructors can take various forms, including written and oral evaluations. Instructors can also be assessed on their ability to effectively use tools and technology that align with CBE/L. Additionally, the outcomes of students' achievements serve as a reflection of the instructors' effectiveness in transferring competencies and guiding students to perform the related tasks successfully. As Sturgis and Casey (2018b) note, educator evaluation should be in line with the culture of competency-based education and its pedagogical philosophy, including supporting teachers through constructive feedback, accommodating their needs, and providing opportunities for growth and development. This approach fosters an

environment where educators can continuously improve their teaching methods and help students reach their full potential.

Baughman, Brumm, and Mickelson (2012) discussed the relationship between course core competencies identified for an instructor training program and the instructor's 360-degree assessment in the workplace.

The assessment process aims to identify and evaluate the top five core competencies: "(a) analysis and judgment, (b) communication, (c) initiative, (d) continuous learning, and (e) teamwork. The 360-degree assessment process is used to assess these five major general competencies" (p. 117). In a 360-degree assessment, the instructor is evaluated by colleagues, subordinates, supervisors, and through self-assessment, providing a comprehensive perspective on their performance and areas for growth.

2.5.3 CBE/L Program's Evaluation

The establishment of a standardized process or method for competency-based education and learning (CBE/L) that suits all educational institutions is neither simple nor feasible, as institutions may adopt different approaches to implementing this method of education. Although there may be similarities in many aspects of CBE/L practice, each institution's design is unique. Cunningham, Key, and Capron (2016) noted that competency-based programs vary from one educational institution to another. Programs and curricula are not uniform; each institution selects its own CBE format. These differences present a challenge for accreditors when it comes to standardizing an educational institution model, as the institutions do not adhere to standard requirements. This situation compels accreditors to assess each competency-based program individually and directly determine the program's efficiency and the institution's approach to designing the program.

Educational institutions can evaluate the success of their competency-based programs by assessing whether their graduates are achieving the required level of competency. The

success of the program is demonstrated through the achievements of its graduates. In other words, the combined levels of mastered competencies across all graduates serve as an indicator of how successful the program is.

Voorhees (2001) found that connecting specific competencies with performance-based assessments creates a bridge between traditional measures of assessing student achievement and competency-based performance approaches. Institutions can conduct internal and external surveys to gather feedback on their programs. Internal surveys may involve students and faculty; students can be asked about their experiences with the college program in terms of curriculum, faculty, tools, equipment, labs, workshops, and other resources. Faculty can be surveyed about the training they received prior to and during their engagement in the CBE/L teaching process. They can also be asked about educational facilitation such as curriculum, teaching, and learning tools.

McNamara (2013) noted that the CBE/L assessment in his study had been conducted "five semesters since 2008 and consistently received positive student feedback via electronic surveys, student focus groups, and formal subject evaluations" (p. 11). This feedback suggests that ongoing assessment and evaluation of competency-based programs can provide valuable insights into their effectiveness and areas for improvement.

Workplaces and employers can provide valuable feedback to colleges regarding their graduates' level of competencies and their ability to perform entry-level job tasks learned during their college education and coordinated co-op programs. By surveying employers, colleges can gain insights into how well their programs are preparing students for the workforce and identify areas for improvement.

Once surveys are analyzed, colleges may choose to engage further with professionals from the surveyed workplaces to discuss potential collaborations for program enhancement and development.

For example, the Council of the National Postsecondary Education Cooperative highlighted various methods for assessing competency-based education (CBE) programs. One approach involves the college's curriculum assessment group reaching out to workplaces and inquiring about graduates' competency levels.

The collaboration process may involve a variety of interaction methods, such as phone calls to executives or a series of focus groups. These interactions can help build stronger relationships between colleges and employers, facilitating better alignment between educational programs and workplace needs. Additionally, surveys can be utilized to assess employees' training needs, providing useful information for both employers and educational institutions in terms of program adjustments and future curriculum development (Jones & Voorhees, 2002).

2.6 CBE/L Implementation Risks and Challenges

Change can be a challenging process, particularly when it involves transitioning to a new educational environment or adopting a new educational approach such as competency-based education and learning (CBE/L). This shift represents a significant change for educational institutions, and, like any other organizational change, it is likely to face numerous risks and challenges.

2.6.1 CBE/L Implementation Risks

In the context of implementing competency-based education and learning (CBE/L), it is crucial to have a risk group as part of the project team to assess and identify potential risks. This process ensures that any known circumstances or issues that could impact the smooth and successful implementation of CBE/L are considered.

The Global Partnership for Education (GPE) (2014) outlines several risk management processes in their risk policy to create a common understanding and awareness of education risk management and risk intelligence:

- Identifying Risks
- Assessing the Consequences
- Managing Potential and Evolving Risks
- Monitoring Risks During the Recovery Process

By incorporating these risk management processes, educational institutions can more effectively navigate the challenges of implementing competency-based education and learning (CBE/L). This approach allows them to anticipate and address potential issues proactively, thereby enhancing the likelihood of a smooth and successful transition to this innovative educational method. By managing risks effectively, institutions can ensure a high-quality CBE/L implementation that benefits both students and educators and meets the needs of the workforce and community.

Preparation of contingency plans to face anticipated risks is crucial when implementing competency-based education and learning (CBE/L). The risks of fraud, such as allowing others to attend classes or take exams on students' behalf, or hacking into online exams or modifying student records, can undermine the integrity of the educational process. Additionally, the flexibility of the CBE/L accumulation process might lead some students to delay complex competencies, potentially resulting in an overwhelming workload toward the end of their studies.

Lopez et al. (2017) argue that creating a sustainable and efficient competency-based education system requires collaborative efforts from all leaders involved. If leaders fail to work together, there is a risk that competency-based education may not be sustained, and inequities may persist, leaving some students without the support they need to realize their potential. Therefore, proactive planning, vigilant monitoring, and a commitment to equitable practices are essential to ensure the successful and fair implementation of CBE/L.

Engaging users in the risk assessment process during the planning stage of competency-based training (CBT) program implementation is critical to ensure that potential risks are identified and addressed from multiple perspectives. Recommendations from users should receive significant attention during the implementation and delivery of competency-based education and learning (CBE/L) to enhance the program's effectiveness and relevance.

Wilson, Hamilton, Britton, Campbell, Hughes, and Manktelow (2005) suggest that employees require regular and refresher training in risk assessment, especially those working in complex and challenging environments. This is essential for both new and experienced employees to maintain a high level of competence and adapt to the evolving demands of their roles. Continuous and regular assessment and development of skills and knowledge are necessary to ensure that employees are equipped to manage the challenges they may face.

Additionally, reviewing program selection criteria to ensure that candidates possess the appropriate emotional abilities to learn and practice their related complex job tasks is important. This can help match candidates with programs that align with their skills, capabilities, and resilience, ultimately leading to more successful learning outcomes and a more effective workforce.

2.6.2 CBE/L Implementation Challenges

When organizations, including educational and training institutions, undertake significant changes or reforms, such as transitioning from traditional to competency-based education and learning (CBE/L), they often face a variety of challenges and resistance. Bridges and Bridges (2016) suggest that the resistance people experience is not directly related to the changes themselves, but rather to the losses and endings they may encounter during the transition. People are often concerned about the potential negative consequences of such a transition, such as disruptions in established routines or the loss of familiar processes.

Taber et al. (2010) and Baran, Correia, and Thompson (2011) outline several challenges associated with implementing CBE/L:

- Identifying Required Competencies
- Assessing Students' Competencies
- Handling Moral Issues: Darling-Hammond (2006) notes that educators face persistent challenges related to the complexity of various moral and ethical issues in diverse educational environments. Preparing teachers to handle these complexities is a constant need.
- Maintaining Continuous Funding
- Overcoming Resistance to Change

Andresen (2015) identified several challenges that teachers may face during the implementation of competency-based education and learning (CBE/L). These challenges can impact the effectiveness of the educational approach and the overall success of the transition.

The key findings from Andresen's research include:

1. Teachers Evaluated as Incompetent: One of the primary challenges is the presence of teachers who have been evaluated as incompetent in their roles. These teachers require additional training to effectively deliver competency-based education and manage challenging situations during their practice. Ensuring that all teachers have the necessary skills and knowledge to successfully implement CBE/L is essential for the approach to succeed.
2. Lack of Proper Training and Problem-Solving Abilities: Without appropriate training, teachers may struggle with problem-solving, especially in critical situations within schools. This can hinder their ability to handle difficult situations both in and out of the classroom. Providing teachers with targeted

training and support can help them develop the skills they need to navigate complex scenarios.

3. Lack of Effective Communication Skills: Effective communication is crucial for CBE/L teachers, as it affects their ability to transfer knowledge and skills to students, particularly through technology. Additionally, teachers need to manage multi-tasking teaching processes, which can be challenging without strong communication skills. Improving communication skills can help teachers better engage with students and facilitate a more effective learning experience.

There are other financial challenges that face educational institutions that have implemented CBE/L because change typically requires extra financial resources. The high cost of CBE implementation and the lack of HR and other specialized resources have prevented many institutions from undertaking CBE/L implementation (Boahin, Eggink, & Hofman, 2014).

Some teachers might feel they are risking their careers by becoming CBE/L instructors. They may not feel they belong to this new teaching approach because of gaps in knowledge, particularly their lack of experience with using technology in education. Therefore, addressing instructors' emotional intelligence is essential before designing specialized training programs. Proper training should then be provided to CBE/L instructors to enable them to perform their duties effectively and feel safe and confident. Sturgis and Casey (2018a) reported that "teachers also need safety and a sense of belonging to take risks as well. Building a culture that supports a high level of trust among adults is important in motivating educators to pursue professional learning" (p. 16).

Engaging various stakeholders in the CBE/L implementation process can lead to a better understanding of complex challenges and foster support among the involved parties. Taber et al. (2010) reported that "Competency-Based Medical Education (CBME) is

associated with a number of complex challenges and questions and cannot be considered in isolation from the complex systems in which it functions" (p. 687). Therefore, it is crucial to involve governmental legal agencies and the medical society in discussions about the advantages and disadvantages of CBME to propose potential solutions to complex challenges. This involvement is necessary because of the confidence and trust that patients and the medical society place in physicians using online or computer-based learning in their CBME.

2.7 Curriculum Analysis and Construction

Educational institutions implementing CBE/L are developing their own curricula for various subjects. These curricula are designed by faculty members to align with the concepts of mastering specific competencies, becoming proficient in performing discipline-related job tasks, and acquiring all related knowledge, skills, and behaviors. Abner, Bartosh, Ungerleider, and Tiffin (2014) stated that some of the main responsibilities of faculty include participating in their professional development through engagement in various programs and workshops. This involvement helps them develop competency profiles, methods for assessing student competencies, program evaluation processes, curriculum development, and the assessment and utilization of technology.

After completing the task analysis process, which includes identifying the main duties, tasks, sub-tasks (if available), related knowledge and skills, and tools and equipment used, a tailor-made curriculum can be designed in coordination with workplaces. This process ensures that the curriculum aligns with the specific needs of future jobs. The University of Baltimore (2005) noted that some job tasks can only be accomplished by adhering to described work procedures and using the required tools and equipment.

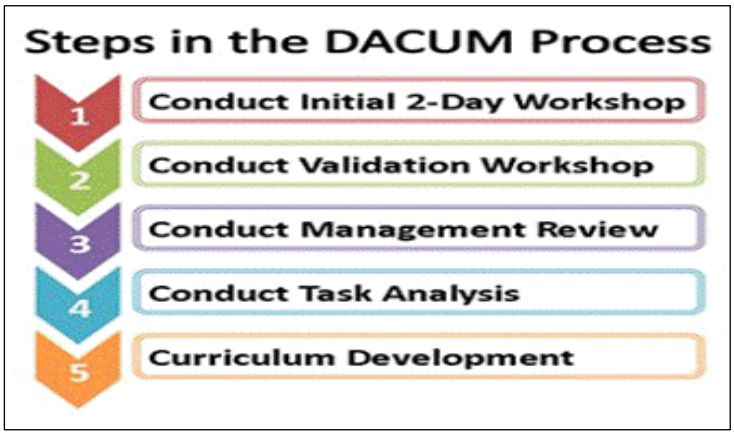
According to Wyrostek and Downey (2017), the objective of conducting a curriculum analysis is to investigate the components of each job or discipline. Each stage in the process

of curriculum analysis includes the following six major parts: (a) performing a needs analysis process, (b) performing job task analysis using the DACUM process through dedicated workshops, (c) verifying the results of the task analysis workshop through subject matter experts, (d) developing a competency profile, (e) conducting a gap analysis to assess employees' gaps, (f) selecting the tasks that need training, and (g) designing and implementing training or education programs.

Appendix (A) provides an example of DACUM charts that depict the main duties of jobs and their connection to job tasks. More detailed charts may include the knowledge and skills associated with each task. Some DACUM charts provide additional details such as sub-tasks, tools, equipment, or software used in each task, as well as working conditions like room temperature or air humidity percentage. The DACUM job analysis process is a well-known method for breaking down a job or discipline portfolio into duties, tasks, sub-tasks, knowledge, skills, and required attitudes or behaviors. This process involves a series of sequenced steps that the group conducting the DACUM session must follow. Refer to Figure 2 for a visual representation.

Figure 2.2

RMIT What is Developing a Curriculum (DACUM). Adapted From Creatrix Campus (2017).



As illustrated in Figure 2, the process of using the DACUM analysis method to develop educational curricula consists of five steps. The first step involves hosting a workshop over two or three days, during which subject matter experts (SMEs) in the targeted discipline participate. The participants create the profile of the targeted discipline, which could be for an accountant, high school teacher, electrical or computer engineer, or any other profession. This profile comprises the main duties, tasks, and any sub-tasks associated with the discipline.

The second step of the DACUM analysis method involves a one-day workshop that confirms and validates the outcome of the initial workshop. In the third step, the management reviews and approves the findings from the first two workshops. In the fourth step, the knowledge, skills, and behaviors associated with each task are identified, grouped, and sequenced to form the competencies. The SME team also determines any tools, equipment, software, or hardware necessary to perform each task. In the fifth stage, the curriculum is constructed based on the grouped and sequenced competencies.

Bawane and Spector (2009) defined a group of related competencies as a sequence of integrated activities, with each competency comprising a combination of related performance procedures or processes. It is crucial to establish reliable standards and procedures when constructing educational curriculums. On the other hand, Taber et al. (2010) noted that without distinguishing valid and reliable standards, it becomes challenging to identify the required competencies. This can negatively impact program evaluation processes carried out by program evaluators and accreditors.

Employers use established standards to evaluate employees' competencies, determining whether an employee can accomplish a task accurately, within a defined period, and without direct supervision—a well-accepted definition of a competent employee. Wyrostek and Downey (2017) explained that the most effective way to define a job is to

specifically identify and explain the job tasks expert employees perform accurately. These tasks require particular knowledge, skills, tools, and attitudes that employees must master. Additionally, they argued that DACUM outcomes are utilized to address various aspects of occupational profiles necessary for curriculum development processes.

2.8 CBE/L Process Effectiveness

Lopez et al. (2017) believe that competency-based education "offers the most effective structure for achieving this educational purpose. However, realizing this purpose for all students requires attention to issues of equity and quality, meeting students where they are, and implementing policies that create the conditions for success" (p. 8).

Conducting evaluations from the student perspective involves assessing whether students in CBE/L programs are acquiring the necessary knowledge and skills and whether they are becoming more competent compared to those studying through the traditional credit/time approach. Additionally, evaluations from the workplace perspective involve determining whether workplaces were involved in developing the CBE/L curriculums and whether they are satisfied with the outcomes of CBE/L programs. The accreditation process remains challenging due to the lack of specific educational standards for the CBE/L approach that can guide accrediting bodies in evaluating the efficiency and efficacy of proposed programs. This issue compels accreditors to handle each accreditation case on an individual basis. Abner et al. (2014) suggested that accreditation and licensing organizations focusing on CBE should re-evaluate their assessment and accreditation procedures and processes. This review should include addressing past concerns, comments, and recommendations received from accreditation bodies or other collaborating educational institutions.

2.9 CBE/L Benefits

The benefits of competency-based education and learning (CBE/L) include equipping graduates with the ability to master their future job tasks by providing them with improved

qualifications, practical experiences, and enhanced competencies during their college education.

Graduates of competency-based education and learning (CBE/L) are more likely to excel in their future job tasks with greater accuracy, efficiency, and minimal or no supervision. They not only acquire practical skills to perform tasks, but they also develop proper behaviors and attitudes while completing assigned duties. In this context, Mulder et al. (2007) suggested that competence should be understood within a framework encompassing professional, technical, behavioral, attitudinal, and cognitive aspects.

Researchers such as Wilson et al. (2005) claim that their findings do not provide conclusive evidence that a competence-based approach is more effective than traditional courses. Although trainees in a competency-based training program reported moderate satisfaction with the training approach compared to those who participated in non-competency-based programs, the researchers caution against generalizing these results. Their study focused on a niche segment of the population, specifically workers in a setting that serves individuals with special needs. As such, the findings may not apply broadly to other settings or different CBE/L practices, trained faculty, or facilities.

2.10 CBE/L Implementation Success Factors

Some studies have illustrated several factors that contribute to the success of CBE/L implementation:

- Good planning: Integrating CBE/L initiatives as part of an educational institution's strategy is crucial for a smooth transition. As Lopez et al. (2017) note, educators must understand how the various components of the new system fit together.
- Management support: Management's prioritization of CBE/L implementation is key to its success. When this initiative is aligned with the institution's strategic plans, all management members are more likely to be committed to ensuring a smooth

transition from the traditional approach to CBE/L. Chauhan (2017) emphasized the importance of leadership commitment during change implementation.

- Stakeholder support: Support from funding organizations is critical for success, helping to mitigate potential resistance from the community. According to Boahin et al. (2014), collaboration among researchers, education specialists, and practitioners can promote good practices and reassure stakeholders of CBE's reliable outcomes.
- Sufficient funding: Major reforms require additional funding. This is true for educational reforms of this magnitude, and without proper funding, the initiative may not succeed or may lack sustainability.
- Proper implementation planning: Careful planning reduces challenges during and after implementation. Planning should include appointing a project manager and qualified team members, identifying potential risks and creating contingency plans, outlining step-by-step processes, setting timelines, and allocating necessary resources. As Lopez et al. (2017) argue, successful implementation of CBE/L can promote coherence and sustainability in long-term planning, guide new designs for accountability and assessment systems, and support educator workforce capacity building.
- Effective communication and reporting: Establishing robust communication and reporting systems is essential to facilitate smooth information flow, document and report on every CBE/L implementation process, and provide easy access to stored data and information. The Competence Based Education Network (2017) emphasized that regular communication among faculty, staff, learners, and external partners is vital to keeping all parties informed of developments and implementing necessary programmatic changes.

2.10.1 Instructors' Roles and Training Requirements

The role of the instructor is very important for CBE to succeed. Bawane and Spector (2009) indicated that preparing online teachers and developing their related competencies requires focused, direct, and intensive practical training. CBE/L teachers need special skills such as listening, problem-solving, and critical thinking.

Andresen (2015) highlighted the importance of developing CBE and CBT instructors to ensure they are competent in their mission. Similarly, Dumciene et al. (2016) emphasized the importance of training and preparing competency-based learning instructors/teachers. Competency-based training can be used to examine the teacher's role and competencies and compare them with traditional, in-classroom teaching. Instructors teaching at various levels need to take on a multi-dimensional role to become more effective online educators.

CBE/L institutions must recognize the instructor's need to learn, master, and possess a broader range of competencies than a traditional teacher. These abilities will empower CBE/L teachers and enable them to translate the easy and complex competencies they have mastered into online learning materials that students can understand. Baran et al. (2011) aimed to use transformative learning theory as a tool to analyze the literature and define the roles of online teachers adopting the competency-based approach, as well as the issue of the lack of empowerment for CBE teachers' competencies.

Some studies have found that teachers involved in technology utilization in the education process need training in computer-based efforts to become familiar with the technology they will use in teaching. Coleman et al. (2016) noted that their "findings from this study support providing teachers with more computer-based training, aiming to improve the quality of classroom integration" (p. 1). Therefore, there is a need to train teachers using practical computer-based training programs that simulate the classroom environment,

integrating technology in the teaching and learning process. Performance is closely related to teachers' cumulative abilities, skills, and competencies.

Conducting customized computer-based teacher training programs will develop their competencies and improve their attitudes toward technology utilization as a main tool for CBE/L education. Coleman et al. (2016) stated that the increase in the integration of computer-based learning requires designing and developing lessons for teachers using computers as the primary means of learning. These lessons serve as interventions designed to enhance teachers' computer skills and attitudes and reduce their anxiety.

2.10.2 Overcoming of Teacher's Challenges

Pantić and Wubbels (2012) argued that understanding the issues surrounding CBE changes compared to traditional methods can provide a clear awareness of the implications brought by educational reforms and the challenges teachers face. Teachers accustomed to classroom teaching find themselves challenged by online teaching practices.
Teachers transitioning from traditional teaching to CBE/L and online teaching may rely on their traditional teaching experience as a reference and need to adapt to new approaches. Some teachers struggle with the limitations of online teaching.

Programs that prepare faculty to adapt to online teaching encourage converted teachers to "critically reflect upon their past experiences, assumptions, and beliefs towards learning and teaching" (Baran et al., 2011, p. 15).

A collaborative work environment is essential for converted teachers. Engaging converted teachers in a series of sessions and workshops to speed up the adaptation process is necessary to "transform their perspectives by engaging in critical reflection, pedagogical inquiry, and problem-solving" (Baran et al., 2011, p. 15).

2.10.3 Engagement of External Stakeholders (Employers)

Some educational institutions implementing CBE/L have realized the importance of aligning their curricula with the competencies demanded by the market and required by the workplace, rather than focusing solely on what they believe students should learn or what students prefer to learn. Horohov (2017) noted that curricula should not reflect what the school envisions students are supposed to learn; instead, they should be designed based on the requirements of outside stakeholders or employers. This approach addresses concerns about potential time and money loss related to job relevance. Recognizing this need drives educational institutions to collaborate with external stakeholders to combine visions and create a new curriculum that considers the competencies students must master to be prepared for entry-level positions in various industries, such as refineries, factories, banks, insurance companies, logistics and transportation, education, health, real estate, and construction.

Ennis (2008) observed that since the 1990s, competencies have been regarded as one of the major human resources and strategic management practices in private and public organizations. These practices impact employee selection, placement, training, performance evaluation, and job classifications.

Additionally, Ennis (2008) highlighted that employers use competencies as a tool for succession planning, helping them identify the best candidates for vacant positions. Educational institutions implementing competency-based education and learning should involve major workplaces and employers from the early stages of constructing CBE/L curricula because they can provide valuable insights into the competencies needed for every job task assigned to new employees.

The involvement of subject matter experts from various workplaces will enhance the development of competency-based curricula and make it more aligned with what students truly need to learn. Whitehead, Selleger, van de Kreeke, and Hodges (2014) emphasized the

importance of engaging employer stakeholders in developing competencies within the healthcare industry. Additionally, Brumm et al. (2006) stated that employers play a key role in identifying graduates with the necessary competencies during recruitment. Students can also be considered stakeholders in the competency development process.

2.10.4 Government Support

For most public colleges, government financial support is crucial for transitioning from traditional education methods to competency-based education. According to Bill (2017), the growth of CBE can be attributed to various factors, such as the American federal government's experimentation with government-funded educational locations to study the impact of federal policies on integrating CBE education in these sites. When government agencies, such as school districts, provide financial resources to schools implementing CBE, it facilitates the transformation process. Without significant financial support from the government, public colleges will struggle to finance the required budget, make necessary changes, acquire needed equipment, and train faculty and staff.

The Competence Based Education Network (2017) emphasized that while institutions work diligently to obtain regulatory approvals, they should always have an action plan prepared to address student and program needs. This is especially important as government officials and external stakeholders (e.g., accrediting bodies, federal legislation) engage in the ongoing revision process of various CBE programs.

2.11 Literature Review Summary

This literature review explores themes related to competency-based education and learning (CBE/L). One of the key areas of focus is whether CBE/L provides a reliable solution for graduates who struggle to find suitable jobs that align with the major or discipline they studied in college.

The literature has explored competency-based learning (CBL) concepts, including its characteristics and the need to incorporate a CBL initiative as part of an educational institution's strategic plans. It also examines the challenges educational institutions face before, during, and after CBL implementation, as well as the risks anticipated by risk groups and the contingency plans to address those risks. The construction of CBL curriculums using methods such as DACUM analysis is discussed, as well as the importance of government and stakeholder support. Additionally, the literature delves into the assessment process of CBL implementation.

The essential role of instructors in the success or failure of competency-based education and learning (CBE/L) underscores the importance of preparing and training instructors to effectively carry out the transformation process. "According to this analysis, teacher roles can be broken down into tasks, tasks into competencies, and each competency into a related group of specific skills" (Bawane & Spector, 2009, p. 3).

The research also highlights the critical impact of technology on CBL processes, and the benefits technology provides to students and instructors. Additionally, the literature outlines the advantages of CBL for graduates and workplaces and discusses the success factors that should be considered during the planning, implementation, and evaluation of a CBL program initiative.

CHAPTER 3: METHODOLOGY

Introduction

This research has assessed the impact of competency-based education and learning (CBE/L) program implementation at one college using quantitative methods. The researcher selected a single college for the study due to the importance of the subject and the need for a thorough investigation. Additionally, the College of Technological Studies (CTS) is the only post-secondary institution that has implemented CBE/L in Kuwait and conducting a study in another country is beyond the researcher's capabilities.

Through collaboration between the College of Technological Studies (CTS) and two major oil companies in Kuwait, CTS was able to develop curricula for two majors. The first major, Refinery Operations, was established through cooperation with Kuwait National Petroleum Company (KNPC). The second major, Manufacturing Engineering, was created in partnership with Kuwait Oil Company (KOC).

Creswell (2014) argued that "In quantitative studies, researchers advance the relationship among variables and pose this in terms of questions or hypotheses" (p. 7). Yin (2017) noted that case studies are not specifically qualitative, quantitative, or mixed method in nature; they can encompass any of these approaches. "When shaping your case study, you might want to determine whether to design and conduct a single or multiple-case study to investigate a research issue" (p. 4).

The research survey instrument was developed through an instrument development process and supplemented with three different sources of archival data. Wacker (1998) noted that case studies are typically used to illustrate examples when applying an analytical conceptual research methodology. Merriam (1998) stated that "the single most defining characteristic of case study research lies in delimiting the object of study: the case" (p. 27).

Merriam (1998) also pointed out that "the case study does not claim any specific data collection methods but focuses on holistic description and explanation" (p. 29). Additionally, Yin (2003) argued that when conducting a case study, the researcher "must be able to develop strong, plausible, and fair arguments that are supported by the data" (p. 127).

The research instrument development process targeted 16 subject matter experts (SMEs) who participated in two focus groups. This approach leveraged the SMEs' expertise to construct the research questionnaires, thus enhancing the validity of the study. The survey targeted major public and private companies that typically employ CTS graduates. It aimed to assess whether these workplaces have observed a significant difference in the competencies of students who graduated in the past three years using CBE/L compared to those who graduated from institutions using the traditional approach to education.

3.1 Research Design

This study utilized two different quantitative data sources: a survey questionnaire and archived data. The research adopted a post-positivism paradigm, aiming to establish whether CBE/L implementation at CTS had a significant impact on students gaining competencies that enabled them to perform required job entry tasks in the workplace. The research also examined whether the levels of competencies CTS graduates achieved during their college studies significantly influenced workplaces' acceptance of CBE/L graduates compared to those who graduated from traditional education programs.

Additionally, the study explored whether the engagement of different stakeholders, such as major industrial firms and government bodies, in the development process of curricula and competencies significantly improved the focus and quality of the programs. The researcher delved into a substantial volume of documents provided by CTS to gain insights into the planning, implementation, and monitoring of CBE/L, as well as the agreements forged with different workplace sectors and government entities. These

documents also shed light on CTS's achievement of ABET accreditation for all its majors or programs.

Chilisa and Kawulich (2012) established that "The post-positivists, like the positivists, believe that there is a reality independent of our thinking that can be studied through the scientific method" (p. 8). The reason for using this paradigm is that it focuses on numerical results based on numerical data. According to Oates (2006), a research strategy provides pre-specified procedures that should be followed to address research questions and fulfill research objectives.

By adopting this type of research, sources of knowledge include empirical experience, perceptions, and evidence. This approach was chosen because the study is a quantitative, scientific type of research that relies primarily on numerical, scientific evidence rather than human judgments. Coy (2019) stated that "Quantitative inquiry employs researcher detachment when administering research measurement tools and objectivity when analyzing research data producing research results" (p. 2). Objectivity is crucial in distinguishing quantitative research methods, where subjectivity can be limited. "Quantitative research examines the representative sample as a whole and identifies norms and ranks observations to predict, explain, or understand phenomena related to the deduction of generalizability to individuals within the larger population" (Coy, 2019, p. 2).

By using quantitative approaches, the researcher focused on facts and explored causality and fundamental laws. This method enabled the researcher to break down the phenomenon or concept of CBE/L into its smallest components and elements. This approach allowed the researcher to test assumed hypotheses. The researcher could maintain independence from the study by ensuring no interference from personal views, motivations, or human interests. Crowther and Lancaster (2008) noted that positivist studies typically

adopt a deductive reasoning approach to test a theory rather than an inductive approach that aims to study and explain a phenomenon.

This study utilized two methods of sampling or data collection instruments. The first method was conducted through survey questionnaires, which were used because of the large size of the population. According to Oates (2006), surveys are systematic tools that collect similar data from a large number of participants in an organized manner. The second method used archived data provided by the College of Technological Studies (CTS) and the Kuwait Civil Services Commission (KCSC), covering 2012-2019 graduates, grades, graduation dates, and employment dates. Additionally, a small set of data on the numbers of CTS graduates between 2012 and 2019 who have pursued higher education programs was provided by the Kuwait Ministry of Higher Education (MOHE).

3.2 Conceptual Framework

The conceptual framework is drawn from the literature and incorporates empirical knowledge related to developing CBE/L programs, as well as illustrating CBE/L students' achievements regarding practical knowledge and skills. Dehpahlavan (2013) found a common understanding among accreditation bodies, educational institutions, and employers that graduates of CBE programs possess the same level of knowledge as their counterparts from traditional educational programs, along with the required practical skills gained through CBE, which ensures faster employability.

The study also explores the importance of engaging various stakeholders in developing CBE/L programs, as such involvement is essential in creating programs that produce accepted graduates. The Center for American Progress recommended to federal policymakers the involvement of employers and other stakeholders in CBE/L program development. They suggested "a convening of business and postsecondary education leaders

to discuss the value of CBE/L to all stakeholders to promote leadership and build consensus on how to move the work forward" (Soares, 2012, p. 52).

This research also explores the outcomes of collaboration between CTS and various employers or workplace organizations in developing tailored curriculums and programs that produce competent graduates for open positions at those employers. Competence Based Education Network (2017) stated that "this edition of the quality framework for CBE programs is intended to inform strong program design, ease accreditation, and build the confidence of regulators working to create a safe space for responsible innovation" (p. 2). By using a conceptual framework, this study has explored effective practices in developing competency-based degree programs in higher education in general and technical colleges in particular to produce competent graduates who are accepted into entry-level positions with industrial employers.

This concept, which suggests that more competent graduates are more desirable for industrial employers, served as the theoretical framework for investigating the effectiveness of implementing CBE/L as an educational approach to enhance technical colleges' graduates' applied knowledge and practical skills.

The independent variables in Figure 3, such as a proper awareness campaign, integrating CBE/L as part of organizational strategies, supporting IT infrastructure, technical support, and curriculum readiness, influence the performance of the intervening variable, CBE/L implementation and practice, as well as the effect of the four moderating variables.

The dependent variables, graduates' competency levels, and students' acceptance in workplaces, are contingent upon the efficacy of the intervening variable, CBE/L implementation and practice. Conversely, Table 3.1 correlates each variable in the conceptual framework with its respective research question.

Figure 3.1

Research Conceptual Framework

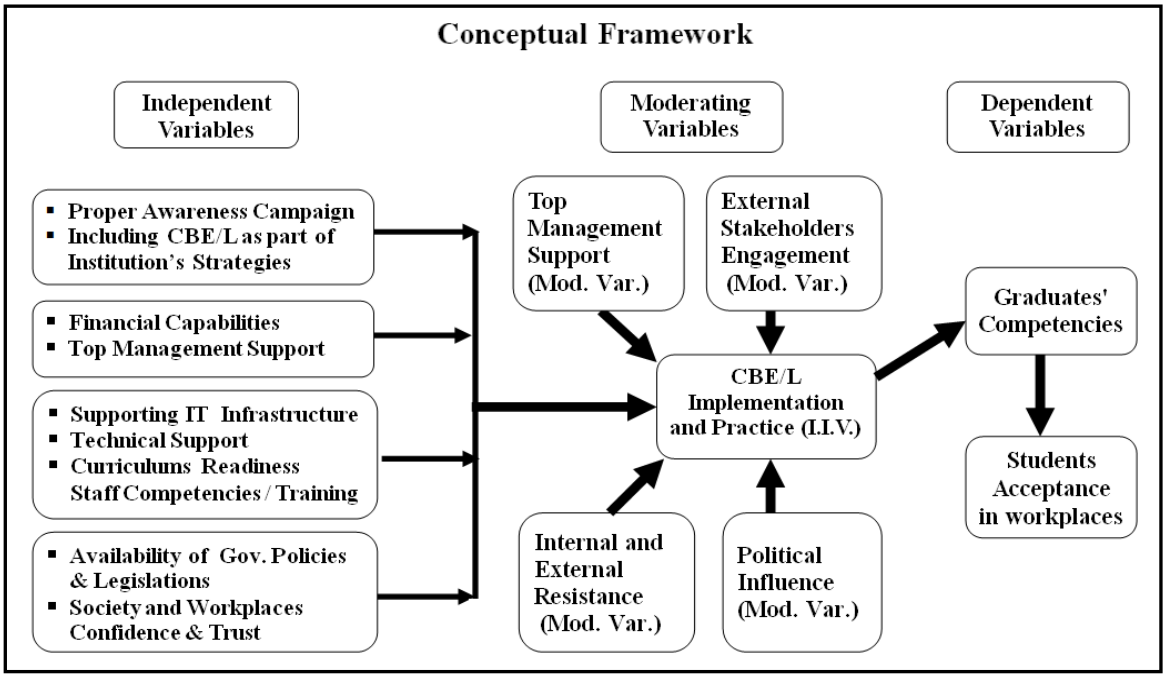


Table 3.1

Description of Research Variables and Their Related Research Questions

Variable	Variable Type	Description / Measures	Answering Research Q(s)
Proper awareness campaign	Independent variable	Spread awareness among internal and external stakeholders of the benefits of CBE/L	1
Including CBE/L as part of organizations' strategies	Independent variable	Educational organizations need to include the CBE/L approach as part of their strategies before starting its implementation .	2
Financial capabilities	Independent variable	The availability of the needed capital to implement CBE/L	2
Curriculum readiness	Independent variable	The completion level of needed CBE/L curriculums	3
Availability of government policies & legislation	Independent variable	The availability of legislation and education policies that support CBE/L approach	1

(Table 3.1 Continued)

Society confidence & trust	Independent variable	If students, workplaces (employers), education bodies, and all society have confidence in the CBE/L approach	1
Top management support (Mod. Var.)	Independent variable	Educational organization boards and top management support for CBE/L implementation	1
Instructors' competencies / training	Moderating variable	If instructors and staff are receiving the proper training and having the required competencies to work in CBE/L schools	1
Internal and external resistance	Moderating variable	The level of internal staff and external stakeholders' resistance to CBE/L approach implementation	1, 2 & 6
Political influence	Moderating variable	Political lobbies influence on legislators to issue the proper support legislation for CBE/L implementation	1
CBE/L implementation and practice	Intervening variable	The implementation of Competency Based Education and Learning educational approach.	2, 3, 4, 5 & 6
Graduates' competencies	Dependent variable	The level of graduates' competencies required to perform basic job tasks required by major employers	5
Stakeholders engagement	Moderating variable	The engagement of workplaces and employers in curriculum development and on-the-job training of students	1, 2, 3 & 4
Students' acceptance in workplaces	Dependent variable	The level of acceptance of college graduates by major employers (workplaces)	5 & 6

Note. Source: Author, 2023

3.3 Data Collection Methods and Sampling Criteria

Data was collected from a 7-point Likert scale quantitative survey, coded numerically. The survey targeted major public and private companies that typically employ CTS graduates. According to Stake (1995), "quantitative data require aggregation and sorting for meanings to become clear" (p. 60). Likert scale surveys are used for data collection due to

the large population size of various workplaces being targeted. Alexandrov (2010) stated that the Likert scale is widely used and commonly employed when collecting information from a large group of people. The selection of large representative samples allows for the detection of relationships and effects that the investigation may seek. Quantitative inquiry assumes that a larger sample size will better generalize the results of the inquiry to the broader population (Leedy & Ormrod, 2010).

The researcher used archived data from CTS, KCSC, and MOHE to compare CTS graduates' employment before and after CBE/L implementation. The researcher thoroughly examined an extensive array of documents provided by CTS to gain insights into the planning, execution, and monitoring of CBE/L by PAAET and CTS. These documents also shed light on the agreements forged with diverse workplace sectors and government entities.

Furthermore, they elucidated how CTS successfully secured ABET accreditation for all its majors or programs.

3.4 Data Analysis Methods

As a quantitative study, data analysis has been carefully conducted to explore whether there was any progress made after implementing new strategies, plans, and projects using CBE/L as CTS's education method.

The data analysis methods used to analyze the data collected from the survey and archived data involved a combination of descriptive and inferential data analysis. The descriptive analysis included calculating frequencies and percentages of survey responses, as well as assessing missing data and outliers. Mishra, Pandey, Singh, Gupta, Sahu, and Keshri (2019) and Bland (2015) noted that summary measures, also known as descriptive statistics, are used to summarize a set of observations, conveying a large amount of information in a clear representation.

Similarly, Sundaram, Wivedi, and Sreenivas (2014) established that descriptive statistics encompass mean, median, and standard deviation, providing a concise overview of the basic characteristics of the data in a study.

Skewness and Kurtosis, as well as Kolmogorov-Smirnov and Shapiro-Wilk statistical testing methods, were conducted to assess the normality, uniformity, linearity, and exponential parameters of data distribution.

Inferential analysis involved chi-square and Kruskal-Wallis tests, as well as other inferential tests of questionnaire responses such as KMO, to examine sample adequacy. A complete scale development process was conducted to identify constructs, assess the internal consistency of the data, and validate the instrument's items or questions. Exploratory Factor Analysis (EFA) was conducted to determine the constructs of the survey items/questions, as well as how much of the total variance was explained by the identified factors, in addition to the percentage representation of each constructed factor of the total variance, or in other words, the weight of each factor. Cronbach's Alpha was used to test the internal consistency of the sample responses, which is a form of internal consistency reliability testing (Cronbach, 1951). The outcome of the analysis provided the researcher with a clear understanding of the degree of development that occurred in relation to the research questions after implementing CBE/L at CTS.

Inferential analysis was conducted to assess whether there was a significant improvement in the accumulated competencies of students who graduated before and after CBE/L implementation. Even though the grouping of questions into categories or themes based on the exploratory factor analysis (EFA) process did not influence the descriptive or inferential analysis results, it provided an organized framework for further descriptive and inferential testing.

This grouping allowed for more focused analysis on specific themes or categories to better understand the impact of CBE/L implementation on student competencies. Alexandrov (2010) and Bhattacherjee (2012) established that the Likert scale, developed by Rensis Likert in 1932, is a commonly used data collection instrument to measure respondents' viewpoints on a particular phenomenon, subject, or area of science. Accordingly, Cronbach's Alpha was utilized to assess the internal consistency and reliability of the responses. Spearman's nonparametric correlation tests were conducted to examine inter-factor correlations among all factors.

There are differing views among scholars regarding the treatment of Likert scale data as interval-like data and whether it can be analyzed using parametric or nonparametric statistical tests. Carifio and Perla (2008) argue that "Likert scales are ordinal in character, and therefore must be analyzed using nonparametric statistics." They note, however, that nonparametric statistics are less sensitive and less powerful than parametric statistics, making them more likely to miss weaker or emerging findings. In contrast, Sullivan and Artino (2013) argue that parametric tests can be used to analyze Likert scale responses. Similarly, Cohen et al. (1999) indicated that a 7-point rating scale was used (1 = disagree completely; 7 = agree completely).

Because conducting surveys using the Likert scale is very effective when data is being collected from large population size of various workplaces being targeted. The selection of large representative samples has allowed the researched from exploring relationships and effects that the investigation may find. The researcher thoroughly examined an extensive array of documents provided by CTS to gain insights into the planning, execution, and monitoring of CBE/L by PAAET and CTS. These documents also shed light on the agreements forged with diverse workplace sectors and government entities. Furthermore,

they elucidated how CTS successfully secured ABET accreditation for all its majors or programs.

3.5 Validity, Internal Consistency Reliability, and Trustworthiness

According to Ghauri and Gronhaug (2010), validity explains how well the collected data covers the real and entire aspects of the intended investigation. In simple terms, validity measures whether the researcher is actually "measuring what is intended to be measured" (Field, 2005, p. 7).

Malakoff (2012) indicated that qualitative researchers need to establish trustworthiness in their research. On the other hand, internal and external validity, reliability, and objectivity need to be verified in quantitative research. According to Rasila (2007), in quantitative research, validity and reliability measure the trustworthiness of the research. "Validity, which refers to the correctness and truthfulness of an inference made from the results of a research study" (Christensen, Johnson, & Turner, 2014, p. 159). This research has demonstrated internal validity, which concerns how researchers infer that a relationship between two variables is causal (Cook & Campbell, 1979, p. 37).

It was crucial for the researcher of this study to ensure the establishment of the research validity, internal consistency reliability, and trustworthiness. This involved verifying that the assumptions were correct or valid, the intended measurements were accurately measured, the research settings remained consistent throughout the process, the research method was appropriate, and the chosen samples were valid for the research purpose. Even if the statistical calculations were valid and mathematically correct, the researcher avoided overemphasizing specific issues, even if deemed important, and ensured that the result interpretations were valid and logically sound.

Bond and Fox (2001) indicated that validity has always been a primary concern for researchers designing effective and sufficient scientific measures, as they seek valid

outcomes by evaluating their data sources and the methods and techniques used to analyze the data.

Due to the critical nature of validity, all researchers should be concerned about potential interference from various variables that may not be relevant to the research aim and purpose but could impact the validation of assumptions and findings (Seliger & Shohamy, 1989). Accordingly, the researcher took measures to ensure that no external influence or pressure was exerted on any of the workplace survey respondents during the data collection process. This freedom of response improved the validity of the study's gathered data.

Internal and external validity are the two main types of validity. Internal validity may be compromised due to internal factors such as lack of control over intervening variables or issues with the data collection process. This could be related to the study design or research instrument. Seliger and Shohamy (1989) noted that research findings may be deemed internally invalid when other intervening variables affect the dependent variables besides those being examined, or when the researcher fails to interpret the data with clear justifications. Moreover, external validity refers to the extent to which the outcomes or findings can be generalized across different settings or environments, such as different times of the year, locations, or sample sizes (Singh & Masuku, 2012).

Moreover, ensuring that the data collection instrument is well constructed and designed is a crucial step because a well-designed data collection instrument allows the researcher to enhance the validity and internal consistency reliability of the study.

Cooper and Schindler (2001) explained that assessing the reliability or internal consistency of a study involves ensuring that the measures used in the study accurately measure their intended targets and determining the accuracy of the study's results. In this regard, Mugenda and Mugenda (2003) indicated that the validity of the questionnaire can be established by applying a construct validity method.

In order to assess our study's construct validity, we need to ensure that our tests effectively measure the concepts they are designed to measure. Seltman (2018) defines construct validity as "a characteristic of devised measurements that describes how well the measurement can stand in for the scientific concepts or 'constructs' that are the real targets of scientific learning and inference" (p. 199). Similarly, Singleton and Straits (2010), and MacKenzie, Podsakoff, and Podsakoff (2011) have indicated that construct validity is the degree to which the specified consistent and sustainable operational definition events are observable or can easily be observed and specifically measure the intended concept, phenomenon, projected idea, or notion.

Bagozzi and Phillips (1991) argue that to validate the study's instrument as trustworthy and reliable, it should exhibit an acceptable internal consistency or reliability score. This is measured by Cronbach's Alpha, a statistic that assesses how well a set of items measures a single unidimensional latent construct. An instrument is considered to have sufficient internal consistency reliability and correlation of responses if the Cronbach's Alpha value is equal to or exceeds 0.7.

This threshold indicates that the items within a scale are measuring the same underlying construct and are highly interrelated. If Cronbach's Alpha is lower than 0.7, it suggests that the scale may not be reliable, and the researcher should consider revising the items or the construct being measured. Therefore, achieving a Cronbach's Alpha of 0.7 or higher provides evidence that the data collected using the instrument can be trusted and reliably used in the study.

Louangrath and Sutanapong (2018) emphasize that Cronbach's Alpha does not directly assess the validity of an instrument or its ability to measure a specific construct. Instead, Cronbach's Alpha measures the internal consistency or the degree of correlation among items within a set, indicating how closely related the responses are to each other.

On the other hand, Sullivan and Artino (2013) argue that Cronbach's Alpha, as well as other methods such as Kappa tests and factor analysis, can provide evidence that the components of the scale are inter-correlated and measure the underlying variable. This perspective suggests that Cronbach's Alpha, while assessing the internal consistency of the instrument, can also serve as an indicator of how well the grouped items measure the underlying construct.

To assess the internal consistency reliability of a survey instrument, it is advisable to use statistical software that can calculate Cronbach's alpha, as recommended by DeVellis (2012). Cronbach's alpha is a measure of the average inter-item correlation and represents the degree to which all items in a scale consistently measure the same underlying construct.

Blunch (2008) suggests that Cronbach's alpha values greater than 0.9 indicate exceptional internal consistency, while values at or above 0.8 represent very good internal consistency. Cronbach's alpha values at or above 0.7 are considered good and acceptable. This aligns with the views of Hair, Anderson, Babin, and Black (2010), who propose that a Cronbach's alpha value of at least 0.70 is generally acceptable. In exploratory studies, alpha values between 0.6 and 0.7 may also be deemed acceptable.

Construct validity is essential in assessing the ability of an instrument to produce the intended results and ensuring that the instrument measures what it is supposed to measure. Testing the internal consistency reliability of a study's Likert scale instrument can provide insight into the trustworthiness and consistency of responses.

Engaging subject matter experts (SMEs) from the College of Technological Studies (CTS) and representatives from the industrial community during the instrument development process can significantly enhance the validity and consistency of the research instrument. These experts contribute their knowledge and experience to ensure that the survey questions are relevant, clear, and aligned with the study's objectives. Their involvement can help refine

the questions and improve their quality, which can, in turn, lead to more reliable and valid data.

3.6 Ethical Considerations

The researcher is correct in emphasizing the importance of ethical obligations when conducting research involving people or organizations. Research ethics encompass the moral, legal, and integrity aspects of the researcher's behaviors and actions throughout the research process, including planning, conducting, and documenting the research (RREE, 2016).

Andersen, Toom, Poli, and Miller (2017) and Resnik (2020) offer important insights into the role of ethics in research. According to their perspectives, research ethics are foundational norms that guide researchers in distinguishing right from wrong and acceptable from unacceptable conduct. Ethical considerations extend beyond the mere choice of methods and procedures to encompass how researchers approach and handle complex problems and issues.

Resnik (2020) emphasizes that ethical norms in research are essential for establishing trust and credibility. They play a critical role in fostering public support for research by ensuring that the research is conducted with integrity and reliability. Ethical research practices build confidence in the quality of the research and its outcomes, thereby increasing the likelihood of receiving public and institutional funding.

Incorporating ethical norms throughout the research process ensures the protection of participants, adherence to legal and institutional guidelines, and the production of trustworthy and credible findings. It also establishes a foundation for the research community and society at large to have confidence in the scientific endeavor and its contributions.

When conducting research, essential ethical behaviors and procedures should be followed to establish integrity, morality, justice, honesty, and professionalism during the

investigation process. Regardless of the consequences and conditions, the researcher should proceed through the research stages in an ethical manner (Oates, 2006). The researcher's ethical behavior helps ensure mutual trust between the researcher and all parties involved in the research process.

While conducting this research, it was essential to adhere to moral behavior, integrity, and honesty to establish mutual trust and confidence between the researcher and the research participants, as well as with the providers of archival data.

Breckler (2009) established that the process of data gathering in science involves maintaining accountability, integrity, moral obligations, and responsibilities, as well as ensuring full confidentiality when private information is involved, during analysis and reporting.

This study is quantitative, and the most important ethical issue is that the researcher must ensure that only approved data from CTS, KCSC, MOHE, and PAAET is presented while maintaining objectivity, openness, honesty, integrity, anonymity, confidentiality, and justice in presenting that data.

The researcher did not allow any predetermined expectations to affect their professionalism in the process of data interpretation. All research participants had the right to choose whether to participate at any time or not participate at all. The participants in the instrument development process and CTS management were informed about the nature of the study and their role during their participation as internal stakeholders (faculty).

CHAPTER 4: RESEARCH FINDINGS AND DISCUSSION

Introduction

In Chapter Three, the researcher presented the research methodology, research design, conceptual framework, data analysis method, data collection method, and sampling criteria. In this fourth and penultimate chapter, the researcher explores the research data analysis, findings, and discusses their implications. This chapter is divided into three main sections.

The first section details the analysis process of the data collected from the survey instrument, which involved responses to questionnaires administered to various workplaces that typically employ CTS graduates. The second section of this chapter focuses on the analysis of data gathered using the second data collection instrument, involving archival data provided by The College of Technological Studies (CTS) and the Kuwait Civil Services Commission (KCSC). This data covers the number of graduates, grades, graduation dates, and employment dates from 2012 to 2019. Additionally, a smaller set of data concerning the number of CTS graduates who pursued higher education programs between 2012 and 2019 was provided by the Kuwait Ministry of Higher Education (MOHE). The results are presented sequentially and discussed accordingly.

The third section covers a cross-matching of the findings from the first and second sections. In this process, the researcher discusses what the data analysis and findings reveal in relation to answering the six research questions and evaluates whether the researcher has accomplished the objectives and purpose of this study.

4.1 The Case Study (CTS)

According to a 2010 report from the Kuwait Civil Services Commission (KCSC), 19.55% of graduate students from traditional colleges in Kuwait faced challenges in securing jobs in their fields of study. Employers cited the lack of practical experience and

competencies as the reason for their reluctance to hire recent graduates. Consequently, when graduates from traditional colleges entered the workforce, they often struggled to perform basic tasks related to their disciplines due to their lack of practical technical knowledge and skills (competencies). This issue has discouraged employers from hiring newly graduated students.

In early 2010, the Kuwait College for Technological Studies (CTS) adopted competency-based education and learning (CBE/L) as its primary method of education. The first cohort of students educated using this approach graduated in 2014. Prior to this, all graduates had been educated under the traditional credit-based learning system. By implementing CBE/L, CTS worked closely with various workplaces to develop new curricula and education plans aimed at producing graduates who are competent and prepared to perform all entry-level tasks and duties upon joining the workforce in their respective fields.

In this study, the researcher aimed to determine whether the implementation of competency-based education and learning (CBE/L) at the Kuwait College for Technological Studies (CTS) significantly impacted students' acquisition of competencies necessary for performing job entry tasks upon joining the workforce. The research also examined whether the competency levels attained by CTS graduates during their college studies influenced workplaces' acceptance of CBE/L graduates compared to those who followed the traditional education approach.

Additionally, the study explored whether the involvement of various stakeholders, including major industrial firms and government bodies, in the development process of CTS curricula, identification of necessary competencies for entry-level graduates, and onsite learning processes, contributed to employers' increased confidence in hiring CTS graduates.

To achieve the objectives of the study, the following six research sub-questions were constructed:

1. To what extent was the CTS awareness campaign effective in informing workplaces, students' parents, and the general society about the anticipated benefits of CBE/L and gaining their support, as well as securing the endorsement of the government and legislators?
2. To what degree was there effective preparation, cooperation, and collaboration between CTS and workplaces to increase the likelihood of a successful CBE/L implementation?
3. Did the process of involving workplaces in curriculum development enhance employers' confidence in the competencies of CTS graduates and increase their acceptance of them?
4. To what extent did on-site practical learning provided to CTS students by workplaces furnish them with the necessary knowledge and skills (competencies), thereby boosting employers' confidence in CTS outcomes and increasing their acceptance of CTS graduates?
5. To what extent did the implementation of CBE/L at CTS significantly impact the competencies of CTS graduates necessary for performing job entry technical tasks, thereby increasing workplaces' approval of their employment?
6. To what degree have workplaces accepted CTS's CBE/L programs, and has this acceptance increased their confidence and satisfaction with CTS graduates following the implementation of CBE/L?

4.2 Data Analysis of Workplaces Questionnaire

As discussed in the data analysis method section 3.5, the researcher conducted both descriptive and inferential data analysis for this study. The descriptive analysis involved calculating frequencies and percentages of replies to survey questions and archival data to provide an overview of the data. Additionally, statistical tests such as Skewness and

Kurtosis, Kolmogorov-Smirnov, and Shapiro-Wilk tests were used to assess the normality of the distribution of the data. These tests help identify any deviations from a normal distribution, which can inform subsequent analyses and interpretations.

Finally, the descriptive analysis included checks for any univariate and multivariate outliers in the data. Identifying and addressing outliers is essential to ensure the accuracy and reliability of the analysis and to avoid skewing the results.

The inferential statistics conducted in this study included tests such as ANOVA, chi-square, and Kruskal-Wallis tests to assess differences among groups and examine relationships between variables. Additionally, the KMO test was used to evaluate the adequacy of the survey sample in relation to the number of questions, providing insight into the level of inter-correlations between general variables and within each factor. This assessment was carried out after conducting an Exploratory Factor Analysis (EFA), which was part of the complete scale development process to identify constructs, assess the internal consistency reliability of the data, and validate the instrument's items or questions.

The internal consistency reliability and correlation of the data were assessed using Cronbach's alpha. This measure helped identify and eliminate items that negatively affected the internal consistency reliability of the instrument's responses. High inter-correlations among items in a scale indicated strong internal consistency, suggesting that items within each factor measured the same construct or theme.

Nonparametric Spearman tests were also conducted to assess items and factor correlations. Through these various analyses, the researcher was able to gain a comprehensive understanding of the data and the relationships among the studied variables. Inferential analysis was conducted to explore whether there was a significant development in the accumulated competencies of students who graduated before and after the implementation of Competency-Based Education and Learning (CBE/L). The research questions were

grouped into categories and themes based on the outcome of the Exploratory Factor Analysis (EFA) test (see Appendix D). Taylor (2019) stated that "interval data is data that is measured on a scale where each point is an equal distance from another." Given this, the ordinal Likert scale data were treated as interval non-parametric data for the purposes of the analysis. The Likert scales included ratings ranging from "extremely agree" to "extremely disagree."

Inferential tests such as ANOVA and Chi-Square tests were employed to assess whether there was a significant difference in the sample mean of the data and whether the implementation of the CBE/L approach had a substantial effect. These tests provided insight into the impact of CBE/L implementation on the competencies of students, allowing the researcher to determine if the changes were statistically significant and indicative of an improvement in student outcomes.

After conducting an Exploratory Factor Analysis (EFA) using the Varimax Orthogonal rotation method, which is typically used when general items are not highly correlated with each other but their inter-item correlation within each factor is relatively high, the following themes or factors emerged. These outcomes of the EFA test are detailed in Appendix D and were used to group and sort the themes or constructs and their items:

Theme 1: Awareness Campaign and Information Exchange before and during CBE/L (AIEX)

Theme 2: External Influence and Government Supportive Laws, Society, and Parents' Support (EGSP)

Theme 3: Coordination and Cooperation Between CTS and Workplaces to Develop Curricula (CCCD)

Theme 4: Cooperation Between CTS and Workplaces during On-Job Learning Programs (OLCP)

Theme 5: CTS Instructors and Workplaces Coaches' Competencies (CIWC)

Theme 6: Workplace Collaboration with CTS before and during the CBE/L Program (WCWC)

Theme 7: Competency-Based Education and Learning Benefits and Workplace Satisfaction (CBWS)

The following constructs (themes or factors) are the outcome of the EFA:

Table 4.1

All 7 Themes, Their Short Names, and the Survey Questions They Represent

N	Constructs / Themes / Factors	Short Name	Transformed Means
1	Theme 1: Awareness campaign and information exchange before and during CBE/L	AIEX	mean of (Q2,Q1,Q23)
2	Theme 2: External Influence and Government Supportive Laws and Society and Parents Support	EGSP	mean of (Q3,Q4,Q14)
3	Theme 3: Coordination Cooperation Between CTS and Workplaces to Develop Curriculums	CCCD	mean of (Q7,Q6,Q8,Q5)
4	Theme 4: Cooperation Between CTS Workplaces during On Job Learning Programs	OLCP	mean of (Q11,Q9,Q10,Q21, Q20)
5	Theme 5: CTS Instructors and Workplaces Coaches Competencies	CIWC	mean of (Q15,Q13,Q12)
6	Theme 6: Workplaces Collaboration with CTS before and during the CBE/L program	WCWC	mean of (Q18,Q19,Q22, Q16,Q17)
7	Theme 7: Competency Based Education and Learning Benefits and Workplaces Satisfaction	CBWS	mean of (Q24,Q25,Q30, Q28,Q29,Q27,Q26)

Note. Source: Author, 2023

4.2.1 Descriptive Data Analysis

The descriptive part of the data analysis allows us to understand the nature of our data and provides a clear inference about its distribution and whether it contains errors or outliers.

Descriptive analysis guides us in detecting patterns among various variables, enabling us to visualize the information within the data and compare different groups or variables.

Additionally, it guides us in selecting appropriate further statistical analysis tests. In this section, the researcher presents the process of testing frequencies and percentages, as well as their outcomes. Following that, the normal distribution of the data will be assessed using Shapiro-Wilk and Kolmogorov-Smirnov tests. Finally, the researcher will evaluate whether there are any missing values or outliers.

4.2.1.1 Assessing Frequencies and Percentages of Survey's Responses. In our descriptive analysis, examining frequencies allows us to verify that the data for each variable is accurate and meaningful. Frequency tabulations provide insight into the number of responses or cases in each survey category for the variables being analyzed. As shown in Table 4.2, the percentage of respondents who scored strongly agree, agree, or slightly agree for all themes is above 90%, with the exception of Theme 1 (Awareness Campaign and Information Exchange—AIEX), which has an average agreement score of 89.2%. While this is still a strong result, it is slightly lower than the other themes. Tables 4.2 and 4.3 also indicate clear evidence of skewness in our data due to the high percentage of responses on one side of the scale.

The test results presented in Table 4.2 show the number and percentage of participants who selected either "Strongly Agree," "Agree," or "Slightly Agree" across all seven themes.

Table 4.2

Percentages and Means of Agree Scores and Themes Means Statistics

Themes	Theme 1	Theme2	Theme 3	Theme 4	Theme 5	Theme 6	Theme7
Scores	AIEX	EGSP	CCCD	OLCP	CIWC	WCWC	CBWS
7 Strong Agree	140.3	184.3	234.3	200.6	180.3	174.2	157.4
6 Agree	155.3	164.0	209.3	156.2	161.0	164.6	165.6
5 Slightly Agree	98.7	56.0	86.5	54.8	76.0	79.0	103.4
Agree Percentage	89.2%	91.4%	97.1%	93.1%	94.4%	94.5%	96.5%
Avg. Means Score of Each Theme	5.85	6.11	6.20	6.15	6.12	6.10	6.05

Note. Source: Author, 2023

Additionally, the table includes the mean scores for each of these themes. Tables 4.3 and 4.4 provide a more detailed breakdown of the data, offering agree percentages and mean scores for every survey question, as well as the average agree percentages and mean scores for each theme.

Table 4.3

Descriptive Statistics After Grouping Themes 1-4 Questions

Percentage of Agree Score of Theme 1			Percentage of Agree Score of Theme 2			Percentage of Agree Score of Theme 3				Percentage of Agree Score of Theme 4				
Q2	**Q1**	**Q23**	**Q3**	**Q4**	**Q14**	**Q7**	**Q6**	**Q8**	**Q5**	**Q11**	**Q9**	**Q10**	**Q21**	**Q20**
90.5	90.3	86.9	91.6	91.4	91.4	96.4	97.7	98.0	96.2	93.0	93.2	91.9	93.7	93.9
Average 89.2 %			**Average 91.4 %**			**Average 97.1%**				**Average 93.1%**				
Means Scores Q1-Q3			Means Scores Q4-Q7			Means Scores for Q8-Q10				Means Scores for Q11-Q15				
5.96	5.77	5.84	6.08	6.19	6.04	6.14	6.28	6.18	6.19	6.16	6.09	6.14	6.25	6.32
Theme 1 Mean 5.86			**Theme 2 Mean 6.10**			**Theme 3 Mean 6.20**				**Theme 4 Mean 6.19**				

Note. Source: Author, 2023

As shown in Table 4.3, the first theme or factor (AIEX) consists of three survey questions:

1. CTS conducted an effective, well-planned awareness campaign on the CBE/L initiative before, during, and after its implementation. The agree score for this question was 90.5%.

2. The CTS awareness campaign on CBE/L was substantial, resulting in spreading enough knowledge about their new education methodology and its anticipated benefits. The agree score for this question was 90.3%.

3. Participants received the required information from CTS on the new education approach that uses competency-based education as a method of learning. The agree score for this question was 86.9%.

Overall, the average agreed scores for all three questions were 89.2%, indicating that a substantial number of respondents agreed that CTS's awareness campaign on CBE/L was substantial and effective in spreading knowledge about the new education methodology and its anticipated benefits. However, around 11% of respondents did not agree that they had received the required information from CTS on the new education approach using competency-based education as a learning method. The mean score for this theme was 87.4.

All three questions mentioned in theme 1 address Research Question 1 (RQ1): "To what extent was CTS's awareness campaign effective in enlightening workplaces, students' parents, and the general society on CBE/L's anticipated benefits, and in gaining their support, as well as obtaining government and legislative endorsement?"

In the second theme/factor (EGSP), which consists of three survey questions, Table 4.3 shows an average agreement score of 91.4%. The first question indicates that 91.6% of participants agreed that the availability of supportive government regulations and policies facilitated collaboration with CTS to develop CBE/L programs. The second question reveals that 91.4% thought public confidence in the CBE/L approach increased its chances of success. Finally, the third question of theme 2 demonstrates that 94.4% agreed that students'

parents and the general society's acceptance of CBE/L was a significant success factor for its implementation. The mean score for this theme was 83.1.

All three mentioned questions of theme 2 address research RQ1 (to what extent the CTS awareness campaign was effective in enlightening workplaces, students' parents, and the general society about the anticipated benefits of CBE/L and gaining their support, as well as the endorsement of government and legislators).

Table 4.3 also reveals that the third theme / factor (CCCD) consists of four survey questions and has an average score of 97.1%, which is a relatively high score. The first question, "The curriculum that was developed in coordination with CTS was efficient and served its purpose," scored 96.4%, while the second question, "Workplaces' (employer's) engagements in developing CTS curriculums were significant and enriched its content," scored 97.7%. The third question, "Workplaces' engagement in the process of constructing CTS curriculums made them more confident in its graduates," scored 98%, and the fourth question, "You have coordinated with CTS for the design of the curriculums of various technical subjects," scored 96.2%. The mean score for this theme was 84.7.

All four mentioned questions of theme 3 also address research RQ3 (Did the process of engaging workplaces in curriculum development enhance employer's assurance in CTS outcomes competencies and increase their acceptance of CTS graduates?). Curriculum development resulted from the cooperation and coordination between CTS and workplaces, which also answers RQ2.

Table 4.3 showed that 93.1% of workplace respondents either strongly agree, agree, or slightly agree with the five questions in the fourth theme / factor (OLCP). The first question (on-site learning and cooperative training made workplaces (employers) more confident in CTS graduates' abilities) scored 93.0%, while the second question (CTS is taking the required actions regarding your OJT comments and reports, which has reflected in

enhancing their education programs and their instructors' competencies) scored 93.2%. On the other hand, the third question (on-the-job learning (OJL) and cooperative training programs were very well planned and were executed successfully) scored 91.9%.

The fourth question (students working during their on-the-job learning cooperative programs are successfully learning on-job tasks' competencies) scored 93.7%, and the fifth question (you have provided CTS with comprehensive reports on students' achievements during their cooperative on-job practical learning and training) scored 93.9%. The mean score for this theme was 84.5.

All four questions within theme 3 also address RQ4 (did the process of engaging workplaces in curriculum development and in the process of on-site practical learning provide employers with more confidence in CTS outcomes competencies and increase their acceptance of CTS graduates?). The second question of this theme additionally responds to RQ2, as it highlights one aspect of the cooperation and collaboration process between CTS and workplaces. The fourth question of this theme also answers RQ5.

Table 4.4

Descriptive Statistics After Grouping Themes 5-7 Questions

Percentage Agree Score of Theme 5			Percentage Agree Score of Theme 6					Percentage Agree Score of Theme 7						
Q15	**Q13**	**Q12**	**Q18**	**Q19**	**Q22**	**Q16**	**Q17**	**Q24**	**Q25**	**Q30**	**Q28**	**Q29**	**Q27**	**Q26**
90.5	95.7	97.1	96.2	94.6	94.1	93.2	94.6	96.4	95.7	96.8	95.5	96.4	97.1	97.5
Average 94.4%			**Average 94.5%**					**Average 96.5%**						
Means Scores Q16-18			Means Scores for Q19- Q23					Means Scores for Q24-Q30						
6.01	6.20	6.13	6.03	5.94	6.19	6.21	6.15	5.99	6.05	5.98	5.96	6.08	6.18	6.12
Theme 5 Mean 6.12			**Theme 6 Mean 6.10**					**Theme 7 Mean 6.05**						

Note. Source: Author, 2023

Table 4.4 reveals that the fourth theme / factor (CIWC) comprises three research questions/items and has an average score of 94.4%. The first question ("You are providing

your coaches with proper facilitation and necessary learning aids, simulators, tools, and equipment, etc.") scored 90.5%, while the second question ("Your staff were very well trained to coach students who are attached to your workplace for their co-op on-site training using the CBE/L approach") scored 95.7%. The third question ("CTS instructors are competent in providing graduates with the proper theoretical knowledge and required competencies before joining their workplaces after graduation") scored 97.1%. The mean score for this theme was 83.0.

All three mentioned questions of theme 4 address RQ2 (to what degree there were good preparations, cooperation, and collaboration between CTS and workplaces to enhance the chance of implementing a successful CBE/L?). This is because the training and enhancement of competencies of workplaces' on-site coaches and CTS practical training instructors are integral parts of the initial and ongoing CBE/L program preparations.

In regard to the fifth construct / theme / factor (WCWC), which concerns workplaces' collaboration with CTS before and during the CBE/L program, table 4.4 shows that it consists of five survey questions, with an average score of 94.5%. The first question indicated that 96.2% of workplace respondents agreed that they provided CTS with the tasks they normally assign to entry-level workers who graduate from technical colleges. For the second survey question, 94.6% agreed that they also provided CTS with the competencies needed to perform each of the tasks usually assigned to entry-level workers who are recent graduates from technical colleges.

Regarding the third question, 94.1% of workplace participants agreed that they had provided the college with the level of competencies required for each task they might assign to entry-level employees. Meanwhile, the fourth question indicated that 93.2% of participants agreed that they had provided CTS with the necessary information to categorize assigned tasks for entry-level employees as critical or non-critical and hazardous or non-hazardous. Finally,

the fifth survey question revealed that 94.6% of workplace participants agreed that they had provided CTS with the tasks that students or graduates who joined their workplace could easily perform or struggled to learn and perform. This theme of workplace collaboration had a mean score of 82.7.

The sixth theme / factor, consisting of five research questions, addressed RQ2 (to what degree there were good preparations, cooperation, and collaboration between CTS and workplaces to enhance the chance of implementing a successful CBE/L?).

The seventh and final dominant factor / theme, CBWS (CBE/L Benefits and Workplaces Satisfaction), consists of seven questions and focuses on the benefits of competency-based education and learning (CBE/L) and workplace satisfaction. It has an average agreement score of 96.5%. According to the first question, table 4.4 shows that 96.4% of participants from various workplaces agreed that students who graduate from the CBE/L approach learn faster than those from traditional learning approaches. Regarding the second question in this theme, 95.7% of responders agreed that graduates from CTS perform tasks they learned in college and during on-job coop training at their sites with the required level of competencies.

The third question result indicated that 96.8% of respondents agreed that graduates from CTS who have been educated using the CBE/L approach reach their satisfactory performance level faster than students who have been educated using the traditional credit-based education system. Moreover, the fourth question revealed that 95.5% of workplace participants agreed that, in general, graduates from the old traditional learning and education system were not competent and were unable to perform basic job functions and tasks. The fifth question result indicated that 96.4% of participants consider graduates from CTS who joined their workforce in the past four years after the implementation of CBE/L to be more competent than those who graduated before the change.

The result of the sixth question shows that 97.1% of respondents agreed that they were satisfied with the level of competencies of CTS graduates and recommended that other technical colleges follow CTS's steps and implement the CBE/L approach as well. Finally, the seventh question result indicated that 97.5% of respondents consider graduates from the competency-based education and learning (CBE/L) approach to be more competent even before starting their coop programs compared to graduates from the previous traditional approach. This theme received a mean score of 81.4.

This theme or factor, with all its seven survey questions, has answered RQ5 (to what extent did the implementation of CBE/L at CTS significantly impact CTS graduate competencies required for performing job entry technical tasks and increase workplace approval of their employment?) and it also answered RQ6 (to what degree have workplaces accepted CTS CBE/L programs, and did it increase their confidence and satisfaction with CTS graduates after CBE/L implementation?). Additionally, question 2 of this theme also answers RQ4.

Research questions 6 and 7 share a strong and tight relationship. While RQ6 focuses on the development of CTS graduates' competencies after the implementation of CBE/L, RQ7 examines workplace satisfaction and acceptance of CBE/L graduates after the implementation of CBE/L. The satisfaction and acceptance of graduates in the workplace largely depend on the level of competencies CTS graduates possess, as highlighted in RQ6.

Descriptive statistics for all seven constructs or factors were performed to present baseline information for our quantitative study. The outcome provides foundational insights into the variables in the dataset and suggests potential relationships between them. Additionally, it confirms that there are no missing values in our dataset.

Table 4.5

Descriptive Statistics for all 7constructs (Factors / Themes) Showing No Missing Values

		AIEX	EGSP	CCCP	OLCP	CIWC	WCWC	CBWS
N	Valid	442	442	442	442	442	442	442
	Missing	0	0	0	0	0	0	0
Mean		5.8522	6.1071	6.1985	6.1946	6.1176	6.1032	6.0527
Median		6.0000	6.3333	6.3750	6.4000	6.3333	6.2000	6.2857
Mode		6.33	7.00	6.50	6.60	6.67	6.60	6.57
Std. Deviation		.85465	.81563	.61333	.74722	.76007	.71158	.64940

Note. Source: Author, 2023

From descriptive statistics table 4.5, we can observe that the means of all factors / themes range from 5.85 to 6.2, while the medians vary from 6.0 to 6.4. The standard deviation ranges from 0.61 to 0.85, and the range spans from 2.00 to 4.67. Detailed descriptive data statistics for all constructs/factors are provided in appendix (E).

4.2.1.2 Assessing Normality, Skewness and Kurtosis of Survey Data. Assessing data normality is essential to determine if the data follows a normal distribution. This assessment helps guide the selection of appropriate statistical tests based on the data's normality status. If the data does not follow a normal distribution, certain statistical tests may not be suitable, potentially leading to inaccurate conclusions. Properly evaluating data normality allows for the use of the most suitable analysis techniques to produce valid and reliable results.

In the data analysis process, Shapiro-Wilk and Kolmogorov-Smirnov tests were conducted to assess the normality of the distribution of workplace responses data. The study used a significance level of $\alpha = 5\%$. If the P-value is greater than or equal to 0.05, the data is considered to have a normal distribution. However, if the P-value is less than 0.05, the variable or item does not have a normal distribution, and non-parametric tests are required.

Non-parametric tests are necessary when the data does not follow a normal distribution (Ghasemi & Zahediasl, 2012).

Normality can be evaluated through statistical methods or graphical representations. Skewness and Kurtosis are well-known statistical methods for assessing normality. Both values should be close to zero for the distribution to be considered normal. Skewness measures the relative size of the two tails, while Kurtosis measures the combined size and amount of probability in the tails. Graphical methods, such as histogram residual plots, can also be used to establish normality.

Table 4.6

Shapiro-Wilk and Kolmogorov-Smirnov Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
AIEX	.184	442	.000	.910	442	.000
EGSP	.179	442	.000	.881	442	.000
CCCD	.188	442	.000	.889	442	.000
OLCP	.226	442	.000	.837	442	.000
CIWC	.191	442	.000	.886	442	.000
WCWC	.153	442	.000	.920	442	.000
CBWS	.231	442	.000	.861	442	.000

Note. Lilliefors Significance Correction Source: Author, 2023

Table 4.6 presents the results of the Shapiro-Wilk test for data normality, showing significance results of 0.000 for all themes, which indicates that the data is not normally distributed. Similarly, the Kolmogorov-Smirnov test of normality also revealed significance results of 0.000 for all themes, further confirming that the data is not normally distributed.

The reason for testing skewness and kurtosis in the data is to understand the asymmetry and 'peakedness' of the distribution. The tests for skewness and kurtosis in table

4.7 confirmed the results from the Shapiro-Wilk and Kolmogorov-Smirnov tests, supporting the conclusion that the data is not normally distributed. We observe sharp left skewness, as the skewness values are negative, indicating an asymmetry toward the left.

Table 4.7

Skewness and Kurtosis Tests

	AIEX	EGSP	CCCD	OLCP	CIWC	WCWC	CBWS
Skewness	-.916	-1.183	-.704	-1.129	-.944	-.818	-1.044
Std. Error of Skewness	.116	.116	.116	.116	.116	.116	.116
Kurtosis	.513	1.368	-.657	.149	.407	-.073	.095
Std. Error of Kurtosis	.232	.232	.232	.232	.232	.232	.232

Note. Source: Author, 2023

This skewness is confirmed as sharp because multiplying the absolute value of the standard error of skewness (0.116) by 3 yields 0.348, which is significantly lower than the skewness statistics of all themes or factors (-0.704 to -1.129). Moreover, dividing any of the skewness values by their standard errors yields values that clearly exceed ±1.96. The negative values from the skewness and kurtosis tests demonstrate clear left skewness, indicating that the data for all grouped themes or factors is not normally distributed. We notice in figures 4.1 and 4.2 the distribution of the data does not have a normal shape for all factors or constructs.

The descriptions provided for Figures 4.2, 4.3, and 4.4 relate to the data distributions for themes 3, 4, 5, 6, and 7 in your study. Below is a summary and interpretation of what these figures indicate about the data distributions:

Figure 4.2 shows the data distribution for theme 3 (Coordination Cooperation Between CTS and Workplaces to Develop Curriculums) and theme 4 (Cooperation Between

CTS Workplaces during On Job Learning Programs). These themes focus on cooperation and coordination between the College of Technological Studies (CTS) and workplaces in curriculum development and on-the-job learning programs.

Figure 4.1

Data Distribution Shape for Awareness and Information Exchange, External, Government, and Parents

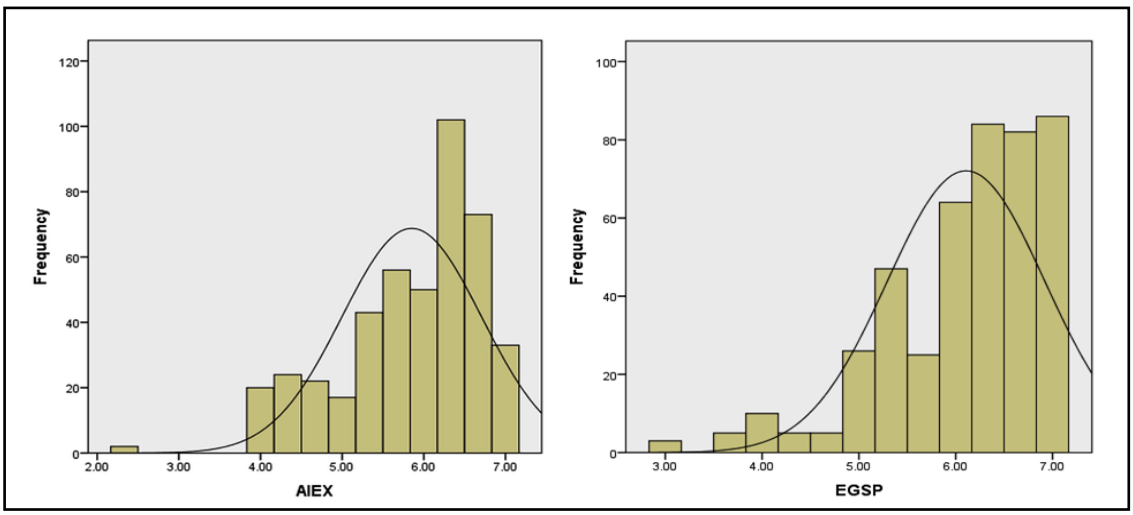


Figure 4.2 is showing data distribution for theme 1: Awareness campaign and information exchange before and during CBE/L and for theme 2: External Influence and Government Supportive Laws and Society and Parents Support.

Figure 4.2

Data Distribution for Coordination and Cooperation for Curriculum Development and On-Job-Learning Programs

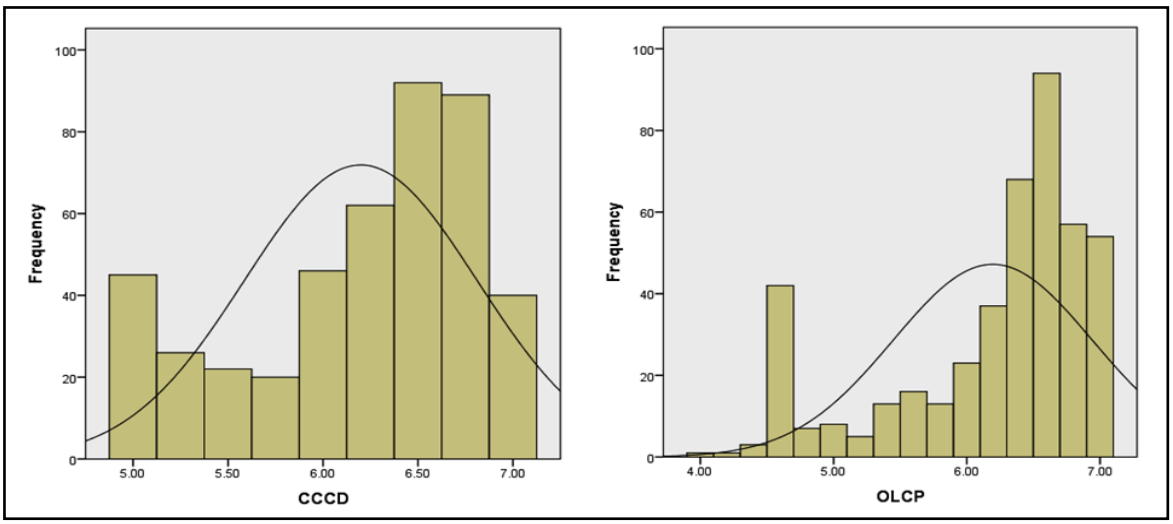


Figure 4.3

Data Distribution for CTS Instructors & Workplaces Coaches Competencies and for Work Collaboration with CTS

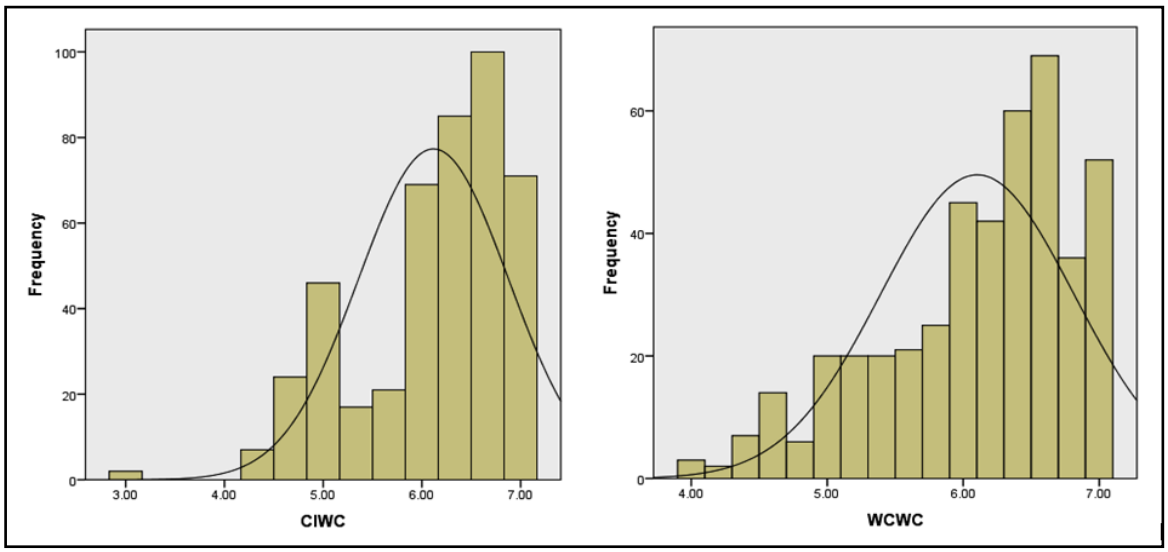


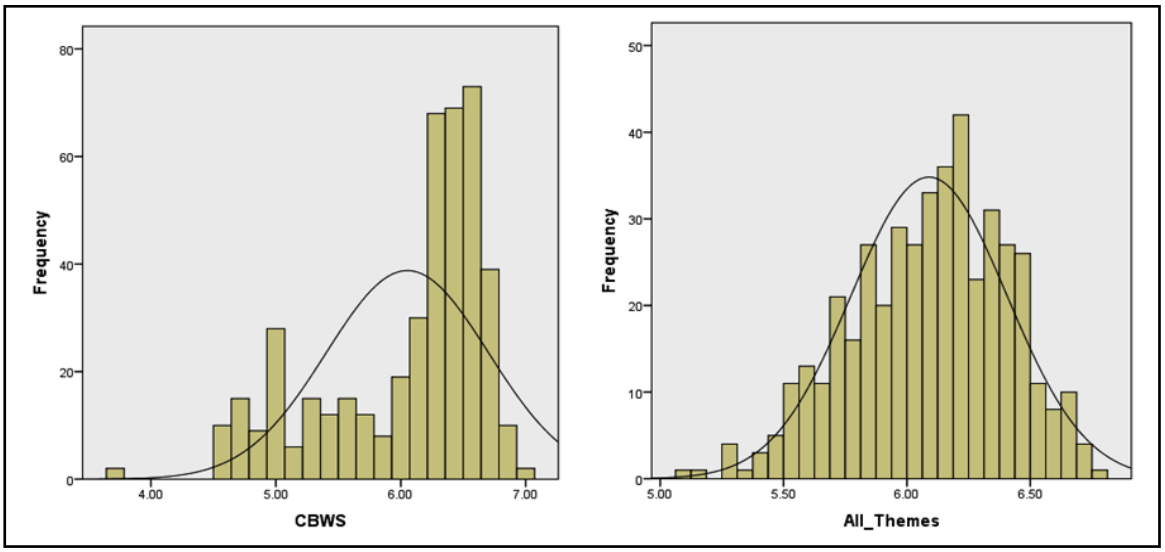
Figure 4.3 represents data distribution for theme 5 (CTS Instructors and Workplaces Coaches Competencies) and theme 6 (Workplaces Collaboration with CTS before and during

the CBE/L program). These themes deal with the competencies of instructors and coaches at CTS and workplaces, as well as overall collaboration between CTS and workplaces. Figure 4.4 depicts data distribution for theme 7 (Competency-Based Education and Learning Benefits and Workplaces Satisfaction) and all themes combined. The description notes that although the distribution might appear visually normal, it is not actually normally distributed because it starts from 5 instead of lower values like 1 or 2 and peaks at 6.2 out of 7 rather than the middle of the 7-point Likert scale (4).

4.2.1.3 Assessment of Missing Values and Outliers and Missing Data. An indication of missing data is when a respondent fails to provide an answer to one or more questions, consequently making the collected data not suitable for further analysis (Hair et al., 2010).

Figure 4.4

Theme 7 CBE/L Benefits and Workplaces Satisfaction and All Items Data Distribution Histograms Shape

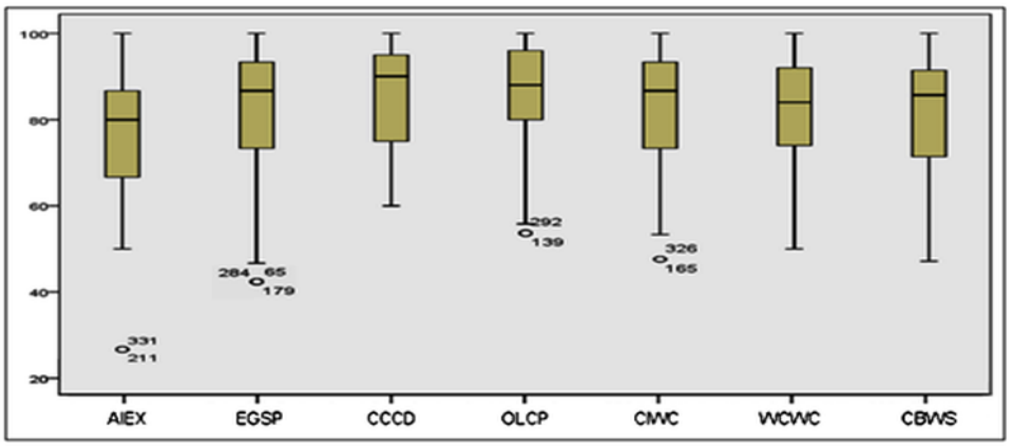


The main reason for assessing whether there are missing values in our data, or the existence of outliers, is that missing data and outliers are indications of poor data quality. When there are too many missing values or outliers, the credibility of the data comes into question because excessive missing data and outliers can significantly influence statistics and conclusions derived from our survey dataset.

As shown in table 4.8, this survey had no missing values or values outside of the answer range because participants had to select one of the options on the 7-point Likert scale to proceed with their survey participation. Additionally, participants could not choose values outside the answer range because the Likert scale selections were pre-set and limited their options. To test for potential outliers in the data set responses, the researcher used box plots. Analysis of the initial outlier testing results in figure 4.5 reveals the presence of nine potential outliers. Two of these nine outliers are located near the lower whisker of the box plot for the OLCP theme, so they will be disregarded. We can also observe that there are two extreme outliers below the lower whisker of the AIEX theme.

Figure 4.5

Outliers Box-Plot with all Possible Outliers for Each Presented Theme.



The remaining potential outliers do not appear to be extreme, as they are not significantly far from the lower whisker and are not directly adjacent to it. Further univariate z-score tests will confirm or refute this box-plot observation.

Outliers are the outermost respondents or data values that can significantly impact the analysis and results of the study (Hair et al., 2010). In this study, the researcher assesses the presence of either of the two types of outliers (univariate and multivariate). Tabachnick and Fidell (2007) recommend using standardized variable values (z-scores) with a threshold of ±3.29 standard deviations away from the mean.

As shown in Table 4.8, only two univariate outliers have been detected using standardized variable z-scores as possible univariate outliers because their standardized values exceeded ±3.29 standard deviations from the mean.

Table 4.8

Univariate Outliers Identified Based on Standardised Variable Values (Z-Scores).

No	Respondents #	Item with standardised values beyond ± 3.29 SD from the mean
1	331	**-3.50064**
2	211	**-3.50064**
3	165	-3.06533
4	326	-3.06533
5	179	-3.00445
6	284	-3.00445
7	65	-3.00445
8	139	-2.26646
9	292	-2.26646

Note. Source: Author, 2023

Negative standardized values indicate that these items have negatively skewed data. Standardized variable values (z-scores) identified two respondents' participations as extreme outliers, with standardized values of -3.50, which is lower than -3.29. The remaining responses are 440 out of 442 (see Table 4.8). Removing just two out of 442 respondents

from the dataset is unlikely to have a significant effect on the data, so the researcher will keep them without deletion.

4.3 Inferential Data Analysis

The researcher conducted several inferential tests to examine the adequacy and internal consistency reliability of the data. The first test, Exploratory Factor Analysis (EFA), was carried out as part of the scale development process to validate that the survey instrument accurately measures the intended constructs. EFA helps explore the factor structure of a measure and assess its internal consistency reliability.

This approach is appropriate as it does not test any specific hypothesis about the underlying structure of the measure. Through EFA, items or questions were grouped into constructs (themes or factors). The researcher also conducted other inferential tests to assess correlations, construct validity, convergent validity, and discriminant validity.

4.3.1 Conducting Exploratory Factor Analysis (EFA)

Table 4.9 shows that our Kaiser-Meyer-Olkin Measure of Sampling Adequacy is 0.792. The KMO test is used to determine whether the survey sample is adequate relative to the number of questions. A higher KMO value indicates that the survey data is more suitable for factor analysis, reflecting stronger adequacy.

Table 4.9

KMO and Bartlett's Test of Sampling Adequacy for the Entire Dataset.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.792
Bartlett's Test of Sphericity	Approx. Chi-Square	5381.724
	df	435
	Sig.	.000

Note. Source: Author, 2023

This indicates that our sampling of 442 responders was very adequate in relation to the number of items (30) presented in the survey.

Table 4.10

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.491	14.971	14.971	4.491	14.971	14.971	4.023	13.411	13.411
2	3.762	12.539	27.510	3.762	12.539	27.510	3.483	11.609	25.020
3	2.921	9.736	37.246	2.921	9.736	37.246	3.287	10.956	35.976
4	2.302	7.674	44.920	2.302	7.674	44.920	2.290	7.634	43.610
5	2.168	7.226	52.145	2.168	7.226	52.145	2.156	7.185	50.795
6	1.912	6.375	58.520	1.912	6.375	58.520	2.136	7.121	57.916
7	1.846	6.152	**64.672**	1.846	6.152	64.672	2.027	6.756	64.672
8	.850	2.835	67.507						
9	.723	2.409	69.916						
10	.700	2.335	72.250						
11	.647	2.158	74.408						
12	.594	1.979	76.387						

Note. Extraction Method: Principal Component Analysis. Source: Author, 2023

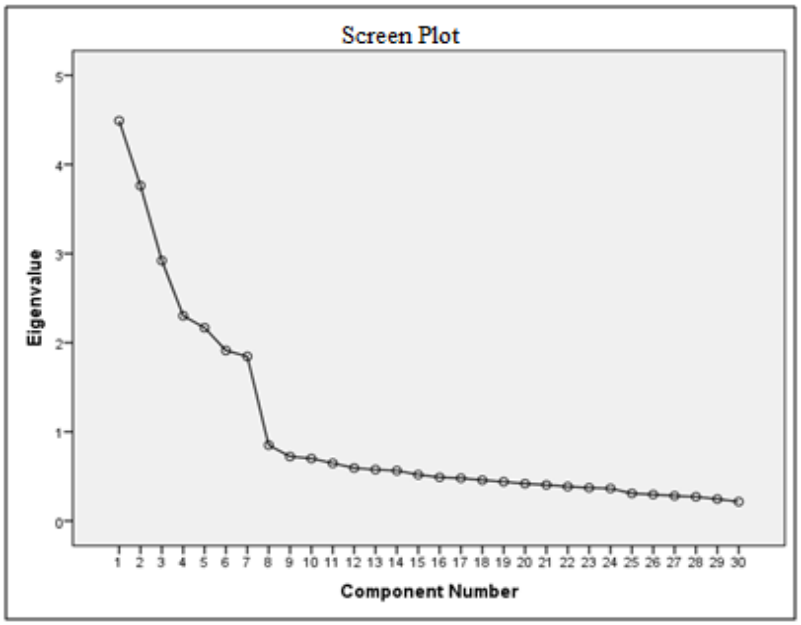
Table 4.10 and screen plot figure 4.6 show that 7 factors were loaded with eigenvalues greater than 1, accounting for 64.672% of the total variance. Over 60% is considered a good representation of the variance (DeVellis, 2016). Samuels (2017) suggests that researchers should limit the number of factors considered to those with an eigenvalue greater than 1. The statistical software provided a default value of Kaiser's criterion (eigenvalue > 1). A higher factor eigenvalue indicates a stronger representation of variance. On the other hand, Grande (2016) argues that researchers can have as many factors as long as each factor has at least three items with a loading greater than 0.4. If this outcome is not

achieved, the researcher must adjust the number of factors to be extracted and rerun the factor analysis. The researcher limited the number of factors considered to those with an eigenvalue greater than 1 and suppressed small coefficient loadings with absolute values less than 0.4.

Table 4.10 shows that the first factor has an eigenvalue of 4.491 and accounts for 14.971% of the total variance, while the second factor has an eigenvalue of 3.762 and accounts for 12.539% of the total variance. The third factor has an eigenvalue of 2.921 and accounts for 9.736% of the total variance. The fourth factor has an eigenvalue of 2.302 and accounts for 7.674% of the total variance. The fifth factor has an eigenvalue of 2.168 and accounts for 7.226% of the total variance.

Figure 4.6

Screen Plot of all Factored Items / Components and Their Corresponding Eigenvalue.



The sixth factor, on the other hand, has an eigenvalue of 1.912 and accounts for 6.375% of the total variance, while the seventh factor has an eigenvalue of 1.846 and accounts for 6.152% of the total variance.

As seen in table 4.10 and figure 4.6, the eighth factor was not included in the analysis because it had an eigenvalue of only 0.850, which is less than 1, and it accounted for just 2.835% of the total variance. This is also true for the remaining factors.

To achieve construct validity, we need to maintain convergent validity, where the loadings of all measures in each factor should be greater than 0.50 (Hair et al., 2010) as shown in table 4.12. Additionally, we need to maintain discriminant validity by examining the inter-factor correlation matrix. The correlations among factors (constructs) should not exceed 0.7, as a correlation greater than 0.7 signifies a higher explained variance (0.7 x 0.7 = 49% combined or shared variance) (Hair et al., 2010). Please refer to appendix (G).

Table 4.11

Component Transformation Matrix

Component /Factor	1	2	3	4	5	6	7
1	.668	.543	.446	.043	.174	.010	.168
2	-.722	.529	.429	.004	.079	.065	-.065
3	.016	-.541	.710	.328	-.072	-.231	-.195
4	-.035	.000	-.124	.792	.022	.559	.209
5	-.061	.021	-.222	.300	.791	-.470	-.103
6	-.120	-.347	.210	-.346	.434	.263	.666
7	.114	-.109	.069	-.233	.380	.583	-.657

Note. Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. Source: Author, 2023

The Component Transformation Matrix shows the correlations between items in each component or factor. Table 4.11 demonstrates that none of the values in the matrix exceeds +0.8 or falls below -0.8. If this were the case, one of the two factors corresponding to the correlation's coefficient value should be removed. According to Field (2013), one of a pair of items in the Component Transformation Matrix with correlation scores higher than 0.8 or lower than -0.8 should be eliminated.

Table 4.12

Rotated Component Matrix After Grouping Items/Questions into Themes/Constructs Name

Factors are sorted by variance % , and loadings by strength	Component / Factor						
	1	2	3	4	5	6	7
CBWS 1	.799						
CBWS 7	.786						
CBWS 6	.773						
CBWS 2	.760						
CBWS 5	.750						
CBWS 4	.736						
CBWS 3	.643						
OLCP 3		.846					
OLCP 5		.835					
OLCP 1		.824					
OLCP 2		.797					
OLCP 4		.777					
WCWC 1			.843				
WCWC 3			.803				
WCWC 4			.800				
WCWC 5			.791				
WCWC 2			.768				
CCCD2				.792			
CCCD3				.766			
CCCD4				.733			
CCCD1				.704			
CICC 3					.875		
CICC 2					.835		
CICC 1					.794		
EGSP 1						.844	
EGSP 3						.829	
EGSP 2						.810	
AIEX 2							.859
AIEX 1							.817
AIEX 3							.735

Note. Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. [a] a. Rotation converged in 5 iterations. Source: Author, 2023

A component factor analysis was conducted to demonstrate how all items or questions group together to form a set of correlated factors that require further analysis. Table 4.12 displays the grouped factors and their loadings. Similarly, Appendix (D) presents the loaded factors and their related questions before they were assigned a theme or construct name. Table 4.12 also indicates that the loadings for all seven factors are above 0.7, which is considered very high, except for the last item in the first factor, CBWS (3), which has a loading of 0.643. Although this is not exceptionally high, it is still significantly greater than 0.5.

As observed in Appendix (F), all communalities' loadings are above 0.5. According to Habing (2003), the communality of a variable represents the proportion of variance in that variable accounted for by all extracted factors. "if the communality of a variable is high, the extracted factors account for a big proportion of the variable's variance. This thus means that this particular variable is reflected well via the extracted factors, and hence that the factor analysis is reliable" (p. 3). Therefore, higher sample size compensate for low communalities.

Habing (2003), argued that, if the communality of a variable is high, the extracted factors account for a large proportion of the variable's variance. "High communalities mean that a specific variable is well-reflected or well-explained through the extracted factors, which implies that the factor analysis is reliable" (p. 3).

When communalities are not high, the sample size can compensate for this issue (Habing, 2003). If the communalities are low, the extracted factors account for only a small portion of the variance, and more factors might need to be retained to provide a better account of the variance. In cases where communalities are below 0.5, it is necessary to increase the sample size. Additionally, items with low communality values should be deleted (Field, 2000).

4.3.2 Conducting Internal Consistency Reliability Tests

Table 4.13 shows that Cronbach's Alpha is 0.764, which is above the threshold of 0.7, indicating that the responses for all items in the instrument demonstrate good internal consistency reliability. This suggests that the survey instrument is reliable in measuring the intended constructs.

Table 4.13

Cronbach's Alpha Test for All Items

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.764	.766	30

Note. Source: Author, 2023

Table 4.14

Internal Consistency of Responses Test Using Cronbach's Alpha Statistics for All 7 Factors

Factor / Theme	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
AIEX	.736	.738	3
EGSP	.780	.781	3
CCCD	.742	.743	4
OLCP	.883	.883	5
CIWC	.789	.793	3
WCWC	.866	.866	5
CBWS	.869	.870	7

Note. Source: Author, 2023

Cronbach's alpha test measures internal consistency and assesses how closely related a set of items or questions are within each group or factor. Table 4.14 presents the internal consistency reliability statistics for all seven factors, demonstrating that each factor exhibits

good, very good, or excellent internal consistency reliability according to Cronbach's alpha values. This indicates that the survey items within each factor are closely related and consistently measure the same underlying construct.

Table 4.14 indicates that the AIEX factor, which consists of three items, has a Cronbach's alpha value of 0.736, which surpasses the threshold of 0.7 and is considered indicative of good internal consistency reliability. The EGSP factor, also comprised of three items, has a Cronbach's alpha value of 0.780, reflecting very good internal consistency reliability.

The CCCD factor, with four items, demonstrates good internal consistency reliability with a Cronbach's alpha value of 0.742. Additionally, the OLCP factor, which consists of five items, boasts an excellent internal consistency reliability value with a Cronbach's alpha of 0.883.

Table 4.14 further demonstrates that the CIWC factor, which consists of three items, has a Cronbach's alpha value of 0.789, indicating very good internal consistency reliability. The WCWC factor, with five items, achieves an excellent internal consistency reliability value with a Cronbach's alpha of 0.866. Finally, the dominant CBWS factor, which consists of seven items, also exhibits excellent internal consistency reliability with a Cronbach's alpha value of 0.869.

4.3.3 Conducting Correlations Tests

Spearman nonparametric inter-items correlation tests has been conducted for all factors and presented in table 4.15.

Table 4.15

Spearman's RHO Correlations for AIEX Factor / Construct

			AIEX 1	AIEX 2	AIEX 3
Spearman's rho	AIEX 1	Correlation Coefficient	1.000	.573**	.440**
		Sig. (2-tailed)	.	.000	.000
		N	440	440	440
	AIEX 2	Correlation Coefficient	.573**	1.000	.385**
		Sig. (2-tailed)	.000	.	.000
		N	440	440	440
	AIEX 3	Correlation Coefficient	.440**	.385**	1.000
		Sig. (2-tailed)	.000	.000	.
		N	440	440	440

Note. Correlation is significant at the 0.01 level (2-tailed). Source: Author, 2023

Spearman's rho correlations test is a non-parametric statistical test used to determine whether there is a significant relationship between data sets. For additional correlation tests for the other six constructs (factors/themes), see appendix (G). The researcher noted in table 4.15 and in all tables in appendix (G) that inter-item correlations in all factors were relatively high. Additionally, the researcher observed that as internal consistency reliability (Cronbach's alpha value) increased, the inter-item correlation also increased. Hajjar (2018) explained that "Cronbach's alpha increases as the inter-correlations among test factors increase, and it is recognized as an internal consistency estimate of reliability of test values" (p. 31).

In the next section, the researcher will conduct a comprehensive data analysis of the archival data, present its findings, and cross-match them with the findings of the survey presented in the previous section.

4.4 Data Analysis of Archival Data

In the first part of this chapter, the researcher presents the data analysis process of the collected data from the first survey instrument, which involved workplaces' responses to questionnaires administered to various workplaces that typically employ CTS graduates. In the second part of this chapter, the researcher uses only descriptive data analysis to examine the second archival data set as a second quantitative data collection instrument to investigate the impact of competency-based education and learning (CBE/L) and to answer related research questions. As indicated in the previous chapter, the archival data was provided by the College of Technological Studies (CTS) and the Kuwait Civil Services Commission (KCSC). It covers data from 2012 to 2019 on the number of graduates, grades, graduation dates, and employment dates.

Additionally, a smaller set of data that includes the numbers of CTS graduates from 2012 to 2019 who have pursued higher education programs was provided by the Ministry of Higher Education in Kuwait (MOHE). The researcher will examine the impact of the implementation of competency-based education and learning (CBE/L) in January 2010 on workplaces' acceptance of CBE/L graduates compared to graduates from the traditional education process before CBE/L implementation. This analysis will involve calculating the overall waiting period for graduates to be enrolled in the workforce before and after the introduction of CBE/L. A shorter waiting period for employment for CBE/L graduates may indicate higher acceptance and demand for these graduates in the workforce.

Additionally, the researcher will analyze whether students' average grades have been significantly affected after the implementation of CBE/L. This examination is important to understand how the new educational approach has influenced academic performance.

The reason for the gradual implementation of CBE/L in stages is to accommodate both CBE/L and traditional education students until all traditional education students have

graduated. This approach provided a transitional period during which traditional education students in their first year had the option to convert to the new CBE/L approach, allowing for a smoother transition for students and institutions.

4.4.1 Analysis of CTS 2012 and 2013 Graduate's Data

Table 1 of Appendix H illustrates the breakdown of all average waiting periods for employment and grades for all majors graduated in both 2012 and 2013.

All graduates from these years completed their education through the traditional learning approach. This data provides a baseline for comparing the employment waiting periods and academic performance of graduates before the implementation of competency-based education and learning (CBE/L). Analyzing this data allows the researcher to establish a reference point for evaluating any significant changes in the graduates' outcomes following the introduction of CBE/L.

The waiting period for employment was quite long for both 2012 and 2013 graduates, averaging approximately 268 days (8.81 months). In 2012, the average waiting period was 270 days (8.88 months), while in 2013, it was slightly shorter at 266 days (8.75 months). This indicates a minimal difference in the waiting period between the two years. Regarding overall grades, there was also minimal variation between the two years. In 2012, graduates had an average grade of 84.33%, while in 2013, the average grade was 84.26%. This suggests that the academic performance of graduates was consistent across the two years. Additionally, the number of graduates increased by only 16 students (5.6%) in 2013, which is not a significant change. Overall, these findings suggest stability in the waiting periods for employment and academic performance of graduates between the two years.

4.4.2 Analysis of CTS 2014 and 2015 Graduates' Data

Table 2 of Appendix H reveals that in 2014, the Refinery Operations Technology major had 95 graduates, 41 of whom were from the CBE/L program, representing 43% of the

total. In contrast, the remaining 51 graduates came from the traditional learning approach. An interesting observation is that all 41 CBE/L graduates had no waiting period for employment. This was due to an agreement between the Kuwait National Petroleum Company (KNPC) and the Kuwait Public Authority for Applied Education and Learning (PAAET), which stipulated that students enrolled in the Refinery Operations Technology major who passed KNPC's English language exam and interviews were eligible to sign a pre-employment contract with KNPC. As a result, if these students maintained a minimum overall GPA of 73% (equivalent to a grade of C), they were fully employed immediately upon graduation. This arrangement significantly benefited the CBE/L graduates by providing them with direct access to employment opportunities after graduation.

Students who were eligible to sign contracts with Kuwait National Petroleum Company (KNPC) received a monthly allowance of 300 Kuwaiti dinars (approximately $980 USD) from KNPC. In addition, they received a monthly financial aid of 200 Kuwaiti dinars (approximately $665 USD) from the Ministry of Higher Education (MOHE), which is provided to all college students in Kuwait until they graduate. This financial support provided students with a substantial monthly income while they were completing their studies, offering them greater financial stability and potentially enhancing their educational experience.

Students who sign contracts with Kuwait National Petroleum Company (KNPC) have the option to enroll in the Kuwait Social Security (Retirement) program. By enrolling in this program, they are considered fully employed students and are no longer eligible to receive the Ministry of Higher Education (MOHE) financial aid. Some students choose to sacrifice the MOHE financial aid in order to participate in the social security program, which allows them to retire a few years earlier than those who choose to continue receiving the MOHE

financial aid. This decision reflects a trade-off between immediate financial assistance and long-term retirement benefits.

Refinery Operations Technology students who do not pass the Kuwait National Petroleum Company (KNPC) English language exam or interview, or both, have an opportunity for a retake after graduation, provided they meet the required GPA and express interest in being employed at KNPC. Graduates have one month to express their interest in working at KNPC. The retake of the English language exam and interview process is typically conducted two to three months later. This opportunity provides graduates with an additional chance to qualify for employment at KNPC.

Table 2 of appendix H reveals that 28% of 2014 graduates completed the newly implemented competency-based education and learning (CBE/L) program. Additionally, there is a noticeable reduction in the average waiting period for employment, which decreased from 270 and 266 days for 2012 and 2013 graduates, respectively, to 247 days (8.12 months) in 2014. This represents a 7.84% reduction in the employment waiting period between 2013 and 2014. In contrast, the number of graduates increased from 684 in 2013 to 794 in 2014, representing a 13.9% increase. Meanwhile, the average grades for each major and the overall grades average showed a slight increase from 84.26% in 2013 to 84.38% in 2014, which is not considered significant.

Table 2 of appendix H demonstrates that 54% of the 2015 graduates completed the newly implemented competency-based education and learning (CBE/L) program. The employment waiting period decreased significantly from 247 days (8.12 months) for 2014 graduates to 228 days (7.23 months) for 2015 graduates, representing an additional 7.69% reduction. In total, the employment waiting period was reduced by approximately 15%.

Additionally, the number of graduates increased from 794 in 2014 to 971 in 2015, marking an 18.2% increase. The average grades for all majors experienced a minor increase

from 84.38% in 2014 to 84.83% in 2015. Table 2 of appendix H also indicates that in 2015, 94 students out of the 145 Refinery Operations Technology major, representing 65%, are CBE/L graduates. These graduates did not have any employment waiting period, as explained previously, while the remaining 51 students in the same major are traditional learning graduates.

4.4.3 Analysis of CTS 2016 and 2017 Graduates' Data

Table 3 of Appendix H shows that the percentage of CBE/L graduates increased to 83% in 2016, while the employment waiting period decreased from 228 days in 2015 to 194 days (6.38 months) in 2016, representing a 14.9% decrease.

The number of graduates significantly increased from 971 graduates in 2015 to 1,118 graduates in 2016, representing a 13.1% increase. The average grades for all majors slightly increased from 84.83% in 2015 to 85.21% in 2016. Additionally, 153 students out of 179 Refinery Operations Technology major students were CBE/L graduates, which accounts for approximately 85%.

Table 3 of Appendix H shows that in 2017, all graduates were CBE/L graduates, and the employment waiting period decreased significantly from 194 days to 166 days (equivalent to 5.46 months). Additionally, the number of graduates increased significantly from 1,118 graduates in 2016 to 1,243 graduates in 2017, representing a 10.1% increase. On the other hand, the average grades slightly increased from 85.21% in 2016 to 85.48% in 2017.

Table 3 of Appendix H reveals that 85% of the Refinery Operation Technology major graduates in 2017 were from the CBE/L program, and they experienced no waiting period for employment. Additionally, there were 86 graduates from the new major, Industrial Engineering - Manufacturing Technology, in 2017. Petrochemicals Industrial Company (PIC) followed a similar approach as KNPC in their Refinery Operation Technology major

by coordinating with PAAET and CTS to establish the Manufacturing Technology major. These findings address research questions RQ2 and RQ6.

The same conditions and privileges offered to students and graduates of KNPC's Refinery Operations Technology are also extended to PIC Manufacturing Technology students. This includes pre-employment contracts, monthly allowances, and immediate full-time employment for graduates who maintain the required C average GPA.

Table 4 of Appendix H shows that in 2018, 100% of graduates were from the CBE/L program. During the same period, the average waiting time for employment decreased from 166 days in 2017 to 156 days (6.38 months) in 2018, which represents a 6.0% decrease.

The number of graduates increased inconsistently from 1,243 in 2017 to 1,307 in 2018, which represents a 4.9% increase. The average grades for all majors saw an insignificant rise from 85.48% in 2017 to 85.68% in 2018. Table 4 of Appendix H shows that all 203 graduates from the 2018 Refinery Operation Technology major and 87 graduates from the Manufacturing Technology major were from the CBE/L program and did not experience any waiting period for employment.

4.4.4 Analysis of CTS 2018 and 2019 Graduates' Data

Table 4 of Appendix H showed that in 2018, all graduates were from the CBE/L program, and the employment waiting period significantly decreased by 6.0%, from 166 days to 156 days (equivalent to 5.13 months). Additionally, the number of graduates increased significantly from 1,243 in 2017 to 1,307 in 2018, representing a 4.9% increase.

Table 4 of Appendix H showed that in 2019, the percentage of CBE/L graduates was 100%. The employment waiting period decreased from 156 days in 2018 to 151 days (4.96 months) in 2019, representing a slight decrease of 3.2%.

Table 4 of Appendix H demonstrated that the number of graduates slightly increased from 1,307 graduates in 2018 to 1,351 graduates in 2019, representing a modest 3.3%

increase. The average grades for all majors were 85.68% in 2018 and marginally improved to 85.72% in 2019. As in other tables, Table 4 of Appendix H shows the breakdown of all average employment waiting periods and grades for all majors in both 2018 and 2019. Furthermore, the table indicates that all 2019 graduates of Refinery Operation Technology major (192 graduates) and Manufacturing Technology major (98 graduates) were from the CBE/L program, and none had an employment waiting period.

4.4.5 General Analysis of CTS 2012-2019 Graduates' Data

Table 4.16 summarizes the data averages from tables 1 to 4 of Appendix H, covering graduates from 2012 to 2019. The table reveals that there were no CBE/L graduates in 2012 and 2013, as all graduates in those years completed their studies under the traditional education system. The data indicates that the percentage of CBE/L graduates began at 28% in 2014, increased to 54% in 2015, and reached 83% in 2016. From 2017 to 2019, all graduates completed their studies through the CBE/L program.

Table 4.16

Data Summary for All Graduates Between 2012 and 2019

Percentage of CBE//L Graduates	No CBE//L Graduates	Percentage of the Decrease in Ave. Employment Waiting Days to Previous Year	Ave. Employ. Waiting Days	Average Grades	Percentage Grad. No. Increase to Prev. Year	Number of Grads	Year
0 %	0	-	270	84.33	-	668	2012
0 %	0	1.5 %	266	84.26	2.4 %	684	2013
28 %	220	7.1 %	247	84.38	13.6 %	794	2014
54 %	527	7.7 %	228	84.83	18.2 %	971	2015
83 %	924	14.9 %	194	85.21	13.1 %	1118	2016
100 %	1243	14.4 %	166	85.48	10.1 %	1243	2017
100 %	1307	6.0 %	156	85.68	4.9 %	1307	2018
100 %	1351	3.2 %	151	85.72	3.3 %	1351	2019

In Table 4.16, we observe a significant decrease in the average number of waiting days for employment from an average of 268 days in the years 2012 and 2013 to 247 days in

2014, representing a 7.1% reduction. The trend of decreasing waiting days continued in 2015, when the average dropped to 228 days, marking a further reduction of 7.7%.

In 2016, the average waiting period for employment decreased to 194 days, indicating an additional reduction of 14.9%. In 2017, the average waiting period continued to decline, reaching 166 days, and demonstrating a significant reduction of 14.4%.

In 2018, the average waiting period for employment further decreased to 156 days, marking a 6.0% reduction. In 2019, the average waiting period for employment continued to decline, dropping to just 151 days and demonstrating another slight reduction of 3.2%.

As illustrated in Figure 4.7, the total reduction in the waiting period for employment by 43% serves as strong evidence of workplaces' satisfaction and confidence in CBE/L graduates. This finding aligns with research questions 3, 5, and 6.

Figure 4.7

The Significant Decrease in the Number of Waiting for Employment Days.

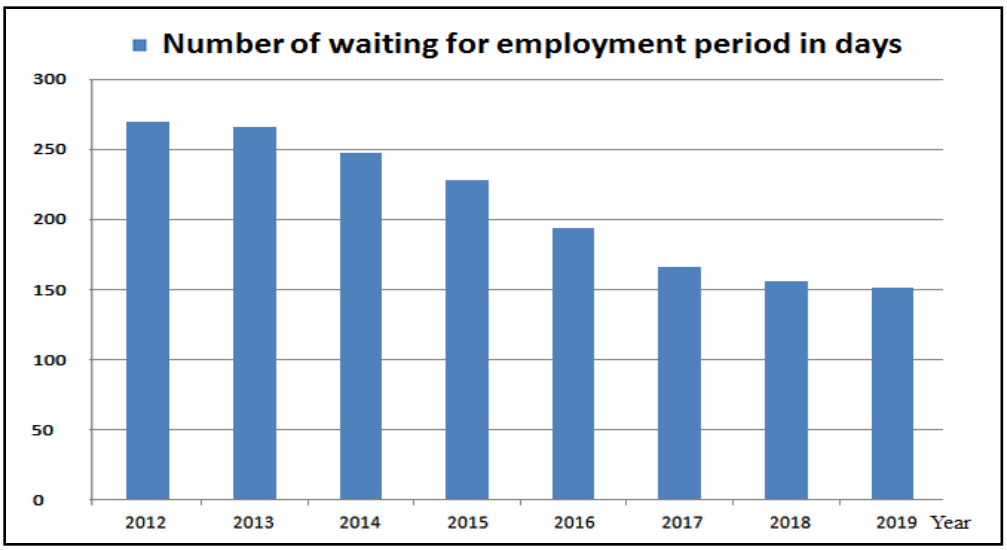


Table 4.16 shows that the number of graduates increased substantially from 668 in 2012 and 684 in 2013 to 794 in 2014, marking an increase of 13.6%. The number of

graduates continued to grow in 2015, reaching 971 graduates, which represents a significant increase of 18.2%.

In 2016, the number of graduates reached 1,118, marking an increase of 13.1%. In 2017, the number of graduates reached 1,243, with an increase of 10.1%. In 2018, the number of graduates increased by 4.9% to reach 1,307 graduates. Finally, in 2019, the number of graduates slightly increased to 1,351, representing an additional 3.3% increase. The overall increase in the number of graduates from 2013 (684) to 2019 (1,351) demonstrates that CTS, in collaboration with various workplaces, successfully raised the number of graduates by approximately 99% over six years.

The 99% increase in the number of graduates over six years is a significant indicator of workplaces' satisfaction and confidence in CBE/L graduates. This finding also addresses research questions 3, 5, and 6, demonstrating the positive impact of the program. Table 4.16 showed a modest increase in the number of graduates between 2012 and 2013, with an increase of only 16 students from 668 to 684 graduates (5.6% increase). In 2014, with the inclusion of 28% CBE/L graduates, the total number of graduates jumped to 794, marking a 13.4% increase. In 2015, with 54% CBE/L graduates, the total number of graduates increased to 971, representing an 18.2% increase. By 2016, 83% of graduates were from the CBE/L program, resulting in a rise in the number of graduates to 1,118 (a 13.1% increase). Refer to figure 4.8 for further details.

Figure 4.8

The Rapid Increase of the Number of Graduates Between 2013 and 2019

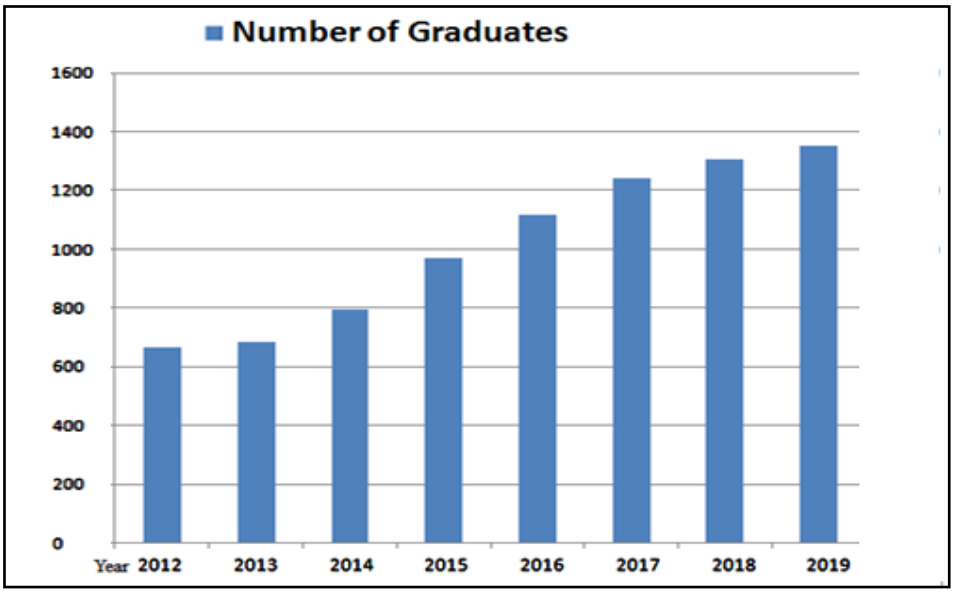


Figure 4.8 depicts a steady growth in the number of graduates. In 2017, all graduates were from the CBE/L program, leading to an increase to 1,243 graduates, which marked a 10.1% rise. In 2018, the number of graduates rose further to 1,307, indicating a 4.9% increase. By 2019, the number of graduates experienced a slight rise to 1,351, reflecting a 3.3% increase. Overall, the total increase in the number of graduates from 684 in 2013 to 1,351 in 2019 is 667 graduates, which constitutes a 99% increase.

The change in students' average grades between 2013 and 2019 was modest. The average grades showed a slight rise from 84.26% in 2013 to 85.72% in 2019, representing only a 1.7% increase.

4.5 CTS Provided Documents, Agreements, Memorandums of Understanding, Reports, Certificates and Contracts

As delineated in Chapters 1 and 3, the extensive documentation provided by CTS proved invaluable in comprehending the intricacies of CBE/L planning, execution, and ongoing evaluation by PAAET and CTS. These documents encompassed agreements and

memorandums of understanding with diverse workplace sectors, social entities, and governmental bodies. Additionally, they illuminated CTS's attainment of ABET accreditation for all its majors or programs. In the subsequent sections, we will delve into some of these agreements and ABET documentations.

The documents have revealed the meticulous process undertaken by CTS to construct curriculums in collaboration with subject matter experts from relevant workplaces or industries. This process commences with a series of DACUM workshops. For instance, the development or revision of the Chemical Engineering Technology program involved thorough research into the labor market's needs, including the execution of occupational analysis via the DACUM process. DACUM entails leveraging expert workers to craft a comprehensive skill profile of the occupation, encompassing all pertinent knowledge, skills, and competencies. The outcomes of the DACUM workshops serve as the foundation for delineating program educational objectives and designing course curriculums that align with these objectives.

4.5.1 Agreements and MOU's With Various Government, Oil, and Private Sectors

CTS has entered into numerous agreements and memorandums of understanding with various government sectors, including Kuwait Municipality, Ministry of Public Works, Ministry of Defense, Ministry of Interior, Ministry of Health, The Public Authority for Manpower, and Kuwait General Fire Fighting Force.

As depicted in Appendix (K), CTS has entered into agreements with Kuwait National Petroleum Company (KNPC), which owns all four of Kuwait's large refineries with a refining capacity of 1.6 million barrels per day. Similar agreements were also made with Kuwait Petrochemical Company (PIC), QUATE Petrochemicals Company, and Kuwait Oil Company (KOC), which oversees most of Kuwait's oil exploration and drilling operations.

Appendix (L) provides a sample of the contract signed by KNPC and all refinery operations major students who passes English language test.

4.5.2 Agreements with Kuwait Society for Engineers (KSE) and Kuwait Society for Inventors Support

As illustrated in Appendix (I), CTS has also entered into an agreement with the Kuwait Society for Engineers (KSE) to enhance cooperation, exchange experiences, develop work mechanisms, and engage in joint activities. This collaboration extends to all scientific and practical fields, including cultural and social activities conducted by the association or the authority for engineer members. Similarly, CTS has signed a comparable agreement with the Kuwait Society for Inventors Support to foster and incentivize creativity and innovation among students during their studies at CTS (see Appendix J). These agreements and memorandums of understanding were aimed at establishing strategic partnerships between CTS, represented by PAAET, and these sectors to meet their needs for competent technical staff to fill various technical positions in government, oil, and private sectors.

4.5.3 Agreement with Kuwait University

Kuwait University and the Public Authority for Applied Education and Training signed a memorandum of understanding, aligning with Kuwait University's policy to bolster scientific research, streamline research implementation procedures, and promote excellence and innovation among researchers. This agreement was the outcome of collaborative efforts between Kuwait University, the Public Authority for Applied Education and Training, and the Office of External Research Cooperation and Consulting at Kuwait University.

4.5.4 Documents on CTS and Workplaces Cooperation in Curriculums Development

The documents unveiled a significant level of collaboration between various workplace sectors and CTS in the development of existing curricula. They also highlighted the substantial contributions of valuable equipment and machinery provided for student practical learning in the college, amounting to millions of dollars. According to the PAAET 2023-2024 annual report, the total student population exceeds 51,000, with over 6,000 students enrolled at CTS.

4.5.5 ABET Accreditation Review Documents and Certification

CTS has obtained ABET accreditation for its programs and sub-programs, a process initiated in 2012 and finalized with accreditation for all programs by 2024. Appendix (M) provides an example of CTS's ABET accreditation for the Chemical Engineering program.

4.5.5.1 Curriculum Compliance Report With ABET Guidelines for Chemical Engineering Program. According to the CTS/ABET self-study comprehensive report, the curriculum for the Bachelor's program in Chemical Engineering Technology was developed using the competency-based model of the Worldwide Instructional Design System (WIDS) performance-based learning model and software. CTS (2023) stated that ABET recognized their use of WIDS, which "emphasizes designing learning and assessment based on outcomes at the program and course level. Curriculum documentation details the relationship between program and course level outcomes, as well as the relationship between outcomes, learning, and assessment" (p. 79).

WIDS is conducting its evaluation process for the CTS chemical engineering technology program curriculum based on ABET requirements and an ABET-accredited engineering technology program. According to WIDS (2024), "Educators built WIDS as a model to guide the design of competency-based learning both at the course and program

level. The power of the Model comes from synthesis. Drawing on proven research and best practices, it connects performance-based assessment" (p. 1).

4.6 Cross Matching for Findings of Survey and Archival Data Analysis

The first part of this chapter covered the data analysis process and findings from the first quantitative survey, while the second part of the chapter discussed the data analysis process and findings from the second set of instruments related to archival data.

In the first section, the researcher performed an Exploratory Factor Analysis (EFA) using statistical software. The EFA results produced seven main themes, constructs, or factors, each associated with a set of survey questions. Each group of questions exhibited high inter-item correlation, high adequacy, and high internal consistency reliability.

The data from the questionnaire or survey were analyzed, with each item or question score recorded, as well as the scores of all factors, constructs, or themes. These scores ranged in value from 78.4 to 84.6, while theme scores averaged between 89.2% for awareness campaign and information exchange and 97.1% for cooperation and coordination in curriculum development.

After analyzing workplaces' responses to all survey questions and recording accumulated scores for all related factors or themes, the researcher began associating each research question with its corresponding theme or factor generated by the statistical software through the EFA process. The scores were then presented and discussed in tables 4.3 and 4.4.

Respondents' average score for all items or questions of the first theme indicated that 89.2% agreed CTS's awareness campaign effectively enlightened workplaces, students' parents, and the general public about the anticipated benefits of competency-based education and learning (CBE/L) and gained their support, along with government and legislator endorsement, addressing research question 1 (RQ1). Additionally, 91.4% of respondents agreed that there

were good preparations, cooperation, and collaboration between CTS and workplaces to improve the likelihood of successfully implementing CBE/L, addressing RQ2.

On the other hand, 97.1% of respondents agreed that involving workplaces in curriculum development enhanced employers' confidence in the competencies of CTS graduates and increased their acceptance of CTS graduates, addressing research question 3 (RQ3). Additionally, 93.1% of respondents agreed that on-site practical learning provided CTS students with the required knowledge and skills (competencies) to make employers more confident in CTS outcomes and increase their acceptance of CTS graduates, addressing research question 4 (RQ4).

Similarly, 94.5% of respondents agreed that the implementation of competency-based education and learning (CBE/L) at CTS significantly impacted CTS graduates' competencies required for performing entry-level technical tasks and increased workplaces' approval of their employment, addressing research question 5 (RQ5). Finally, 96.5% of respondents agreed that workplaces had good acceptance of CTS's CBE/L programs and that this increased their satisfaction with CTS graduates after CBE/L implementation, addressing research question 6 (RQ6).

On the other hand, archival data showed that the 43% reduction in the waiting period for employment and the 101% increase in demand for more CBE/L graduates over six years indicate that:

First, PAAET and CTS succeeded in their awareness campaign, gaining the trust and confidence of students, parents, workplaces, and the general public in accepting competency-based education and learning (CBE/L) as an educational approach, addressing research question 1 (RQ1): "To what extent was the CTS awareness campaign effective in enlightening workplaces, students' parents, and the general society about the anticipated

benefits of CBE/L and gaining their support, as well as government and legislator endorsement?"

Second, the collaboration and cooperation between CTS and workplaces, which resulted in a reduction in the waiting period for employment across all majors and an increase in demand from workplaces for more graduates, answers research question 2 (RQ2): "To what degree were there good preparations, cooperation, and collaboration between CTS and workplaces to enhance the chances of implementing a successful competency-based education and learning (CBE/L) program?" The ongoing demand by workplaces for more CBE/L graduates in various engineering fields led CTS to accept more students each year.

Third, the acceptance of more students at CTS and the reduction in the waiting period for graduate employment were clear indications of a substantial shift in workplaces' perception of CTS graduates' competencies. A major reason for this change was the involvement of workplaces in creating practice-based curricula rather than relying on traditional approaches. According to Zu (2018), "the construction technique and application of marketing practice curriculum system is based on the target of the cultivation of professional talents" (p. 193). Additionally, the experiences graduates gained during their on-site practical learning contributed to this shift, addressing research questions RQ4, RQ5, and RQ6.

These two aspects of workplace engagement in developing competency-based education and learning (CBE/L) curricula and workplace reception of students for on-site training to gain practical experience address research question 3 (RQ3): "Did the process of engaging workplaces in curriculum development enhance employers' confidence in CTS graduates' competencies and increase their acceptance of CTS graduates?" and research question 4 (RQ4): "To what extent did the process of on-site practical learning offered to CTS students by workplaces provide them with the required knowledge and skills

(competencies) to make employers more confident in CTS outcomes and increase their acceptance of CTS graduates?"

Moreover, CTS made a concerted effort to involve workplaces at every stage of forming CBE/L curricula, and the commitment of workplaces to train students on-site to gain practical experience played a significant and essential role in enhancing students' competencies and abilities to perform entry-level technical job tasks and duties.

These two aspects address research question 5 (RQ5): "To what extent did the implementation of competency-based education and learning (CBE/L) at CTS significantly impact CTS graduates' competencies required for performing entry-level technical tasks and increase workplace approval of their employment?"

Finally, archival data analysis has revealed that as the proportion of CBE/L graduates increases, the overall number of graduates also rises, and there is an inverse relationship with the waiting period for employment; as the proportion of CBE/L graduates increases, the waiting period for employment decreases.

The archival data analysis also indicates that as the percentage of CBE/L graduates increases, the demand for more graduates by workplaces rises, suggesting an increase in workplaces' satisfaction and confidence in CTS CBE/L graduates' competencies. These finding answers research question 6 (RQ6): "To what degree have workplaces accepted CTS CBE/L programs, and has it increased their confidence and satisfaction with CTS graduates after CBE/L implementation?" This is considered the core research question.

Similarly, archival data analysis showed that as the percentage of CBE/L graduates increased, average waiting periods for employment significantly decreased from 266 days (8.75 months) in 2013 to only 151 days (4.96 months) in 2019. This represents a total reduction of 43.2% in the average employment waiting period between 2013 and 2019. This decrease in employment waiting period is another indication of the increased confidence and satisfaction

workplaces have in CBE/L graduates' competencies, which answers research question 6 (RQ6) as well.

The average grades did not change significantly between 2013 and 2019. The average grade in 2013 was 84.26%, which insignificantly increased to 85.72% in 2019, representing an increase of only 1.7%. The researcher asserts that even if there were a significant change in average grades before and after the implementation of CBE/L, comparing the data of graduates' average grades before CBE/L implementation with the data of graduates' average grades after CBE/L implementation would not be valid due to the use of different education and learning methods and the representation of different sample groups.

A comparison between the average grades for the years 2017, 2018, and 2019 is possible since all graduates during these years completed their studies through the CBE/L program. This comparison reveals that there was not much difference in average grades between 2017 (85.48%), 2018 (85.68%), and 2019 (85.72%), with a variation of less than 0.5%.

Finally, the researcher has provided various discussions on the data analysis from the two instruments and the related findings in answering the six research questions. These discussions demonstrate that the researcher has achieved the objectives and purpose of this study.

In the next chapter, the researcher will present the study's conclusion, contributions to academic literature, recommendations, limitations, and suggestions for further research in related areas.

CHAPTER 5: CONCLUSIONS, RECOMMENDATIONS, AND FURTHER RESEARCH

Introduction

The Kuwait Civil Service Commission (2010) report noted that most fresh graduates from CTS were not being accepted to work for various major workplaces due to their lack of practical skills needed to perform basic entry-level technical tasks and duties. In response, CTS began a plan to adopt the competency-based education and learning (CBE/L) method to enhance graduates' knowledge and skills (competencies) and enable them to become more competent graduates.

The researcher conducted this study to examine whether this shift in education methodology or approach has significantly impacted various workplaces' confidence and satisfaction with CTS as a result of the implementation of CTS's competency-based education and learning (CBE/L) approach.

The study was also conducted to determine whether there was a significant relationship between the implementation of competency-based education and learning (CBE/L) and the reduction of the employment waiting period for graduates. Additionally, the researcher aimed to assess whether the implementation of CBE/L had a substantial impact on CTS graduates' competencies and abilities, enabling them to perform entry-level job tasks and duties. Finally, the researcher sought to establish whether this impact influenced workplaces' satisfaction and level of acceptance of CBE/L graduates compared to those with traditional credit-based education. The primary research question of this study was:

To what extent did the implementation of competency-based education and learning (CBE/L) at CTS impact the provision of required competencies to students?

To answer this main question, the research addressed the following six sub-questions:

1. How effective was the CTS awareness campaign in informing workplaces, students' parents, and the general public about the anticipated benefits of CBE/L, and in gaining their support as well as the endorsement of government and legislators?
2. To what degree was there good preparation, cooperation, and collaboration between CTS and workplaces to improve the likelihood of successfully implementing CBE/L?
3. Did involving workplaces in curriculum development enhance employers' confidence in CTS outcomes and increase their acceptance of CTS graduates?
4. To what extent did the process of on-site practical learning provided to CTS students by workplaces supply them with the required knowledge and skills (competencies) that boost employers' confidence in CTS outcomes and increase their acceptance of CTS graduates?
5. To what extent did the implementation of CBE/L at CTS significantly impact CTS graduates' competencies for performing entry-level technical tasks and improve workplaces' approval of their employment?
6. To what degree have workplaces accepted CTS's CBE/L programs, and did it increase their confidence and satisfaction with CTS graduates after CBE/L implementation?

After analyzing the survey and various archival data presented in the previous chapter, the researcher has explored different perspectives regarding the impact of competency-based education and learning (CBE/L) implementation. Based on this exploration, the researcher reached several conclusions that will be detailed in the next section. Wong (2019) stated that "the future of competency-based learning and workplace-

based assessment lies in transforming medical and health education. These approaches provide consistency across the learning continuum, from the undergraduate to postgraduate and professional development levels."

5.1 Conclusions

This study has concluded that a significant development has been achieved after the implementation of CBE/L program at CTS.

5.1.1 Conclusions Drawn from Survey Findings

Based on the analysis of survey data, including frequencies and percentages of responses to research questions 1, 2, and 23, the findings lead the researcher to conclude that an awareness campaign and information exchange before and during the implementation of competency-based education and learning (CBE/L) were crucial for educating students, parents, the education community, and the general public about the expected changes in education curricula and methodology. C-BEN (2017) established that institutional awareness campaigning is focused on the buy-in for competency-based education as an isolated program targeting education institution faculty and staff. This conclusion aligns with the study's findings, which emphasize the crucial role of awareness campaigns in persuading all stakeholders about the expected benefits of CBE/L for CTS students, workplaces, and the general community

Based on the analysis of survey data for questions Q3, Q4, and Q14, the researcher concluded that the support and endorsement of government education boards, along with the revision of education laws, regulations, and policies, significantly bolstered the competency-based education and learning (CBE/L) approach. This support gave CTS more confidence in their plans and implementation. Lacey and Murray (2015) noted that "these new regulations create a framework for the oversight and approval of competency-based programs offered by in-state institutions and include provisions relating to assessments, recordkeeping, reporting,

and policymaking" (p. 11). Burke (1989) stated that "the competency-based education model can be traced through a number of government White Papers from the 1980s" (p. ix).

According to this study's findings from survey data for questions Q3, Q4, and Q14, having the necessary laws, policies, and regulations in place gave CTS the confidence to transition from traditional education, which had been in place since 1954, to a new and different educational approach.

On the other hand, data analysis findings for questions Q7, Q6, Q8, and Q5 led the researcher to conclude that collaboration between CTS and workplaces to develop new curricula was a key factor in the successful implementation of competency-based education and learning (CBE/L).

Pichette and Watkins (2018) noted that "Westminster College, Southern New Hampshire University, and the University of Wisconsin have gone a step further by designing competency-based education (CBE) programs from scratch, starting with the competencies employers seek and building the curriculum and assessments around them" (p. 12). The authors have also stated that "in every case, curriculum design is a collaborative effort involving faculty and employers" (Pichette & Watkins, 2018, p. 12).

The data analysis findings for questions Q11, Q9, Q10, Q21, and Q20 led the researcher to conclude that collaboration between CTS and workplaces during students' on-job learning programs enabled students to gain the necessary knowledge and skills (competencies) to perform entry-level work tasks and duties. Such cooperation in identifying the needed competencies by workplaces is explained by Jones and Voorhees (2002) how have argued that, "the leaders began with a list of competencies and asked faculty and employers to identify the most important areas to focus on within the curriculum. In a similar manner, the president of Northwest Missouri State University conducted a Delphi study to

identify the essential competencies that undergraduates should master to be effective in the workplace."

Similarly, Pichette and Watkins (2018) recommended that "institutions should consider working with employers to integrate workplace skills relevant to the discipline. Employers are eager to be involved in program design processes, and their involvement helps build familiarity with the idea of hiring graduates from specific programs" (p. 21).

The research confirmed that the cooperation and coordination between CTS and major private, government, and oil sectors in constructing practical curricula to meet workplace needs, along with the significant impact of on-job competencies learning for CTS students, were seen as the fruits of this collaboration.

The findings established that increased involvement of workplaces in shaping college curricula results in outcomes better aligned with the skills and knowledge (competencies) needed by those workplaces. Besides imparting the necessary skills to students during their education, workplaces also require practical skills and competencies that enable students to perform entry-level tasks. Employers who participate in designing curricula and provide on-site training ensure that students are well-prepared for the tasks required by these employers.

During his site visit to CTS workshops, the researcher observed that the cooperation between CTS and major workplaces such as oil, petroleum, gas, and petrochemical companies extended beyond training CTS students to become proficient with their on-site machines. These companies also contributed large machinery, such as Honeywell oil pumps, to CTS's on-campus workshops. Additionally, the Ministry of Electricity provided some of its large General Electric transformers.

Contributions from the oil sector and ministries were provided to CTS without complications, as both CTS and all major oil companies in Kuwait are government-owned. Gaining competencies using these actual large machines in the college workshops

significantly benefited students, reflecting the fruitful collaboration and cooperation between CTS and major workplaces.

The researcher also observed that when a student mastered a task and was ready to demonstrate it in front of an instructor, other students gathered to watch the performance. As the student was assessed on the degree of mastery to pass the related subject, the audience of students not only provided encouragement but also learned from the performance and the instructor's comments and suggestions.

The researcher also noted that instructors prioritized safety precautions before and during the practical assessment. Instructors asked hypothetical safety questions to gauge the students' readiness. This approach seemed to provide students with a motivational boost, encouraging them to demonstrate the task and undergo assessment. Guiamalon (2021) argued that, when assessing graduates' required and appropriate competencies at workplaces, the "finding implies that when graduate education course offerings were highly appropriate, the graduates' work competencies tended to be highly competent" (p. 58). Consequently, the assessment process can be carried out either by trained instructors who have received training at major workplaces or by coaches designated by these workplaces to assess complex tasks involving advanced machinery or control software.

Furthermore, our data analysis findings for questions Q15, Q13, and Q12 led us to conclude that CTS faculty, instructors, workplace coaches, and trainers at various workplaces need to participate in training programs to develop their training and coaching competencies.

In their conclusion, Curry and Docherty (2017) stated that "competency-based education (CBE) is directed toward the widely shared goal of improving workplace performance by providing graduates with relevant outcome competencies. Achieving this goal will require the pedagogical enterprise to evolve beyond the usual faculty and administrative knowledge and skill set" (p. 70).

The researcher concluded that maintaining competent college instructors, trainers, and on-site workplace coaches was another key success factor for the competency-based education and learning (CBE/L) program.

In addition to all the above conclusions, based on data analysis findings for questions Q16, Q17, Q18, Q19, and Q22, the researcher also concluded that sustaining the success of competency-based education and learning (CBE/L) programs requires ongoing collaboration, coordination, and partnership meetings between workplaces and CTS before, during, and after the CBE/L program implementation.

Moreover, based on survey data analysis findings for questions Q24, Q25, Q26, Q27, Q28, Q29, and Q30, the researcher concluded that the impact of competency-based education and learning (CBE/L) not only reduced the waiting period for employment but also influenced workplaces' acceptance and confidence in CTS graduates. This conclusion was drawn from the significant increase in the number of enrolled students, which was reflected in the substantial rise in the number of yearly graduates. This increase indicates growing satisfaction and demand from workplaces for CTS graduates and demonstrates workplaces' increasing trust in the competencies and abilities of CTS graduates to perform entry-level tasks and duties. Morgeson, Brannick and Levine (2019) indicated that "A person job or role specification, sets out the education, qualifications, training, experience, personal attributes and competences a job holder requires to perform her or his job satisfactorily. Person specifications are used in recruitment and selection." (p. 446). The increase in demand for more graduates from CTS clearly indicated workplace satisfaction with the CBE/L approach.

Finally, survey data findings allowed the researcher to conclude that various workplaces' satisfaction with the competency-based education and learning (CBE/L) approach and its benefits in enhancing graduates' competencies and capabilities to perform entry-level tasks and duties was established. This goal was considered the most important

objective that CTS aimed to achieve. Curry and Docherty (2017) confirmed that "CBE provides direct measures of attained competence regardless of time spent, location, or method used to acquire the competence, thus decoupling traditional expectations of time in place (lecture, service, course) from mastery or competence" (p. 69). Consequently, the previous claim by workplaces that they could not hire non-competent graduates is no longer valid. The reason for that is the fact that workplaces were responsible for student's onsite practical learning, using workplace's own tools, equipment, and machinery.

The survey questions have provided a wealth of information, leading to several conclusions. In the following sections, the researcher will elaborate on how archival data and CTS documents have also contributed to reaching conclusions. A legitimate question that the reader might pose is: are there other factors that may have influenced the CBE/L implementation process and practices beyond those addressed in the study and that have contributed to these conclusions?

The researcher has outlined in section 2.10 what he referred to as CBE/L success factors drawn from the literature, such as effective planning, management support, stakeholder engagement, adequate funding, proficient project management, and efficient communication and reporting. While these factors, among others, may have played a role in reaching these conclusions, it is evident from the survey questionnaire responses that there was a notable satisfaction among major employers with the outcomes of CBE/L competencies and abilities.

Although CTS was established in 1954, there was no noticeable change in employers' acceptance rates, waiting periods for employment, or graduate numbers until 2014, when the first cohort of CBE/L students who enrolled in 2010 began to graduate. As the proportion of these students increased, the overall waiting period for employment decreased, and demand for CBE/L graduates, particularly in the oil and gas sector, rose.

Additionally, as noted in the first chapter, CTS is a government-owned educational institution and one of the nine colleges and institutes under the Public Authority for Applied Education and Training (PAAET). It adheres to Kuwait's policy of replacing expatriates with skilled Kuwaiti employees, especially in the public and oil sectors.

Finally, the researcher concluded that the positive development in workplace acceptance of CTS CBE/L graduates, which has led to increased demand for more CBE/L graduates, is supported by the overwhelming 96.5% agreement or strong agreement responses to survey questions 26, 29, and 30. These questions inquired whether workplaces were satisfied with the level of competencies of CTS graduates, whether they recommended other technical colleges to adopt the CBE/L approach, and whether CTS graduates, who had completed their on-job coop training at the workplaces, demonstrated the required competencies. Additionally, the survey assessed whether workplaces perceived CTS graduates who joined their workforce in the past four years, since the implementation of CBE/L, as more competent than before.

5.1.2 Conclusions Drawn from Archival Data Findings

The researcher's findings from the archival data led to the conclusion that the implementation of competency-based education and learning (CBE/L) had a significant impact on four major issues related to this study's research questions. First, the impact of CBE/L implementation on the average waiting period for CTS graduates to find employment was notable. The archival data clearly indicated that the average number of days graduates waited for employment decreased by 117 days between 2013 and 2019, representing a 43.7% reduction, which was considered a significant achievement.

This conclusion addresses research question 5 (To what extent did the implementation of CBE/L at CTS significantly impact CTS graduates' competencies for performing job entry technical tasks and increase workplaces' approval of their employment?). Morgeson,

Brannick and Levine (2019) explained that work-based or occupational competences are gained by employees according to workplaces performance expectations, and according to occupational measures, standards, specific roles, tasks, and outputs that employees are expected to be accomplish.

5.1.3 Conclusions Drawn from Provided Documents

CTS provided documents detailing its initial studies and plans to transition from traditional education programs to CBE/L methods, offering a clear insight into PAAET and CTS's efforts to successfully implement this conversion. These documents included numerous agreements with various Kuwaiti government, oil, private, and public sectors aimed at enhancing cooperation between CTS and these workplace sectors. They revealed significant collaboration between these workplace sectors and CTS in developing existing curricula and showcased the substantial contributions of valuable equipment and machinery used by students in their practical learning endeavors, valued at millions of dollars.

Documents such as student sponsorship contracts between CBE/L students and organizations like KNPC, EQATE, and KOC in the oil and petrochemical sectors, signed immediately upon enrollment, led us to conclude that major oil sector workplaces are satisfied with the competencies and capabilities of CTS CBE/L graduates even before their graduation.

Archival data indicated that the number of accepted graduates from CTS increased from 684 in 2013 to 1,353 in 2019, representing approximately a 99% increase. This substantial rise is strong evidence that workplaces are more satisfied with CTS graduates' abilities and competencies, enabling them to perform job entry tasks and duties. This conclusion addresses research question 4 (To what extent did the on-site practical learning offered to CTS students by workplaces provide them with the required knowledge and skills

(competencies), thereby increasing employers' confidence in CTS outcomes and their acceptance of CTS graduates?).

The significant reduction in the waiting period for employment and the substantial increase in demand for CTS graduates, which prompted CTS to accept more students and nearly double the number of graduates, suggests that workplaces have greater trust and confidence in CTS graduates and are more satisfied with the outcomes of the competency-based education and learning (CBE/L) program. This conclusion addresses research question 6 (To what extent have workplaces accepted CTS CBE/L programs, and did it increase their confidence and satisfaction with CTS graduates after CBE/L implementation?).

The archival data showed that the average grades in 2013 were 84.26% and increased slightly to 85.72%, representing a mere 1.7% increase. Since the education program transitioned from a credit-based traditional education approach to a competency-based education and learning (CBE/L) approach, comparing grades between the two different education methods is challenging due to differing sample environments.

The researcher concluded that the study's outcomes suggest that the objectives set by CTS and PAAET were achieved through collaboration with various major workplaces.

As a result of the success of competency-based education and learning (CBE/L), Petrochemicals Industrial Company (PIC) followed the example of KNPC Refining Operation Technology's coordination with PAAET and CTS to establish a Manufacturing Technology major. Their celebration of graduating 86 students from the new major (Industrial Engineering - Manufacturing Technology) in 2017 (see Table 3 of Appendix H) provides clear evidence that workplaces such as PIC were satisfied with the CBE/L approach to the extent that they customized their own sub-major (Manufacturing Technology).

5.1.4 The Author Past Engagement in Competency Based Training (CBT)

As stated in Section 1.1 of this study, the author was not involved in the implementation of CBE/L at CTS. However, their interest in the subject was sparked during their participation in the implementation of competency-based training (CBT) for employees at Kuwait National Petroleum Company (KNPC). This involvement was part of a corporate project titled "Individuals Development Planning," which began in 1991 and continued until the end of 1994. During this time, the researcher served as a Senior Specialist in the Career Development Corporate Department of KNPC.

The researcher's involvement in the competency-based training (CBT) project at Kuwait National Petroleum Company (KNPC) sparked a profound interest in the competency-based approach, leading him to explore the impact of competency-based education and learning (CBE/L) at the College of Technological Studies (CTS). Upon expressing this interest to CTS management, they welcomed the proposal to conduct this dissertation to examine the impact of CBE/L at their institution.

5.2 Contribution to Academic Literature

For the past three decades, competency-based education and learning (CBE/L) has emerged as a fast-growing educational approach. However, relatively few empirical studies have been published on CBE/L globally compared to other education and learning-related topics.

This study establishes a direct link between competency-based education and learning (CBE/L) and four major variables. Firstly, it examines how CBE/L enhances graduates' knowledge and skills (competencies), providing them with the tools they need for success in their careers. Secondly, it explores the connection between graduates' competencies and their ability to perform job-related tasks and duties, highlighting the practical applications of their education. Thirdly, it assesses the role of workplaces in supporting CBE/L graduates,

both in shaping educational institutions' curricula and facilitating on-site learning experiences that contribute to graduates' competence and professionalism in the workplace. Lastly, the study investigates the relationship between CBE/L implementation and workplace satisfaction, ultimately resulting in the acceptance of graduates as employees with the entry-level competencies needed for their roles. This multifaceted approach provides a comprehensive understanding of the impact of CBE/L on graduates, workplaces, and the broader job market.

This case study has demonstrated that competency-based education and learning (CBE/L) plays a significant role not only in producing competent graduates but also in showing how cooperation and coordination between major public and private workplaces and colleges can create a better environment for students to learn practical skills in addition to the theoretical knowledge typically acquired in classrooms.

In this study, the researcher used several research questions and two different data collection instruments (a survey and archival data) to validate the assumption, or theory, adopted by CTS management that competency-based education and learning (CBE/L) enhances graduates' chances of finding jobs more quickly than those who graduated using traditional grading education systems.

Researchers and academic institutions, particularly technical colleges and universities, may benefit from this research as an empirical study that statistically demonstrates the advantages of the competency-based education and learning (CBE/L) approach.

This study will impact colleges that have already decided to implement the CBE/L approach, as well as those contemplating its potential adoption. It will serve as both a motivational experience and an additional resource for college decision-makers, informing them of the potential advantages of CBE/L in enhancing students' practical competencies and improving their acceptance rates by employers. The study will provide valuable insights into

the implementation process, helping colleges intending to adopt CBE/L understand the experiences of others and offering guidance on the process. Additionally, it will highlight various success factors that may have been crucial in facilitating the implementation of CBE/L at CTS.

The findings of this study could serve as a valuable tool for CBE/L project teams, demonstrating that success with the CBE/L approach is not limited to pioneering institutions like the University of New Hampshire in the US, but also includes another success story from Kuwait with CTS.

5.3 Recommendations

The researcher has a number of recommendations that were drawn from the research findings. Additionally, insights were gathered from visits to CTS and an extensive review of the large volume of documents provided, offering the researcher valuable knowledge about the CTS CBE/L program implementation and the college relationships with various stakeholders. I addition to the findings of this study, the researcher recommends that other technical colleges consider introducing competency-based education and learning (CBE/L) as an educational approach by following these guidelines:

- ❖ The study revealed that there was a need to conduct an effective awareness campaign. Competence Based Education Network (2017) established that prior to CBE, there is a need to ongoing action steps should be taken to improve institution-wide awareness and engagement with various stakeholders.
    - Study results and CTS documents shown that CTS has documented every step of the implementation process and approved plans. Koenen, Dochy, and Berghmans (2015) found that while competency based education is implemented, it is required from higher education bodies to “document the

implementation process and how they know that graduating students have obtained the necessary competencies that support their respective degrees" (p.1)

- The study results revealed the need to ensure all necessary resources are available before starting the implementation phase. Scoresby, Tkatchov, Hugus, and Marshall (2018) indicated that in order "to define our expectations for CBE program development, we looked for resources available to help institutions get started in creating quality CBE programs, such as the Competency-Based Education Network" (p.1).
- The outcome of the study showed the need to conduct a comprehensive market study and involve major public and private workplaces from the early stages of the awareness campaign through planning and implementation. Scoresby et al. (2018) added that "we realized the need to research various potential applications of CBE and our unique student market to effectively customize a quality, learner-centered, competency-based learning experience for our students." (p. 1)
- The study explained the need to insure that all decisions and plans comply with local laws, regulations, and policies to avoid future issues. Competence Based Education Network (2017) established that "the institution has developed policies and procedures for its CBE program that support learning and the learner experience while maintaining compliance with regulatory requirements. (p. 7)
- Finally, recognize that changes in students' competencies and workplace satisfaction and acceptance may take multiple competencies mastering trials to develop gradually. "learners are offered varied learning exercises, activities, and experiences to promote learner engagement and to provide multiple

opportunities for development of competency mastery" (Competency Based Education Network, 2017, p. 13).

5.4 Study's Strengths, Limitations, and Suggestions for Further Areas of Related Research

Although it is a single case study, its strength lies in the use of data triangulation, which involves using multiple data sources or instruments such as survey questionnaires and various archival data sources. The use of multiple data sources helps to compensate for potential weaknesses in the collected data or the lack of a mixed-method research design.

The primary limitation of this study was its reliance on a single case study. According to Yin (2014), while single cases can produce novel and rich theoretical insights, this methodology can be particularly intimidating and challenging for organizational scholars. These challenges may affect the researcher's ability to generalize findings and conclusions from the single case study. While generalization is a primary goal for researchers to apply their findings across various conditions or environments, it is more challenging to generalize from a single study.

To address this limitation, the researcher not only cross-checked his findings using two different data collection instruments but also compared them with findings from other similar studies. Scholars such as Burgelman (1983) have established that using a single case study can be more appropriate than multiple case studies in certain extreme and complex research contexts. Additionally, limited time and resources can inhibit academic researchers from conducting multiple case studies. Moreover, conducting single case study will enable the researcher from performing a deep exploration and study more details and perspectives of the phenomena.

Another limitation of this study was that while it concluded that competency-based education and learning (CBE/L) is effective for technical majors, it was inconclusive

regarding its effectiveness in other fields such as accounting, finance, and administrative majors. Additionally, the study did not fully explore how CBE/L might work well in certain learning environments but less effectively in others. In other words, it remains unclear whether this educational approach is suitable for majors where the skills and competencies are not easily identifiable or measurable.

The study did not address the challenge of accommodating new skills and knowledge (competencies) required for performing new tasks, operating new machines, or incorporating new technology.

Additionally, this study did not address whether competency-based education and learning (CBE/L) accommodates social learning or discuss whether this approach has positively influenced students' attitudes toward learning.

The study also did not investigate whether the outcomes or graduates of CBE/L were prepared not only to meet employers' needs for competent new graduates but also to determine whether CBE/L contributed to preparing learners to be innovative and ready for an uncertain future.

This study did not address the perspectives of CTS graduates after entering the workforce, nor did it consider CTS faculty impressions of their students' learning outcomes and development before and after the implementation of competency-based education and learning (CBE/L). Additionally, the study did not explore whether graduates had encountered new experiences and their reflections on those experiences.

A potential area for further research is to investigate and compare the experiences of other educational institutions with competency-based education and learning (CBE/L) to the findings of this study. Another possible research direction is to conduct a study that compares CBE/L with traditional instructional approaches, including lectures, demonstrations, cooperative learning, collaborative learning, and case study methods.

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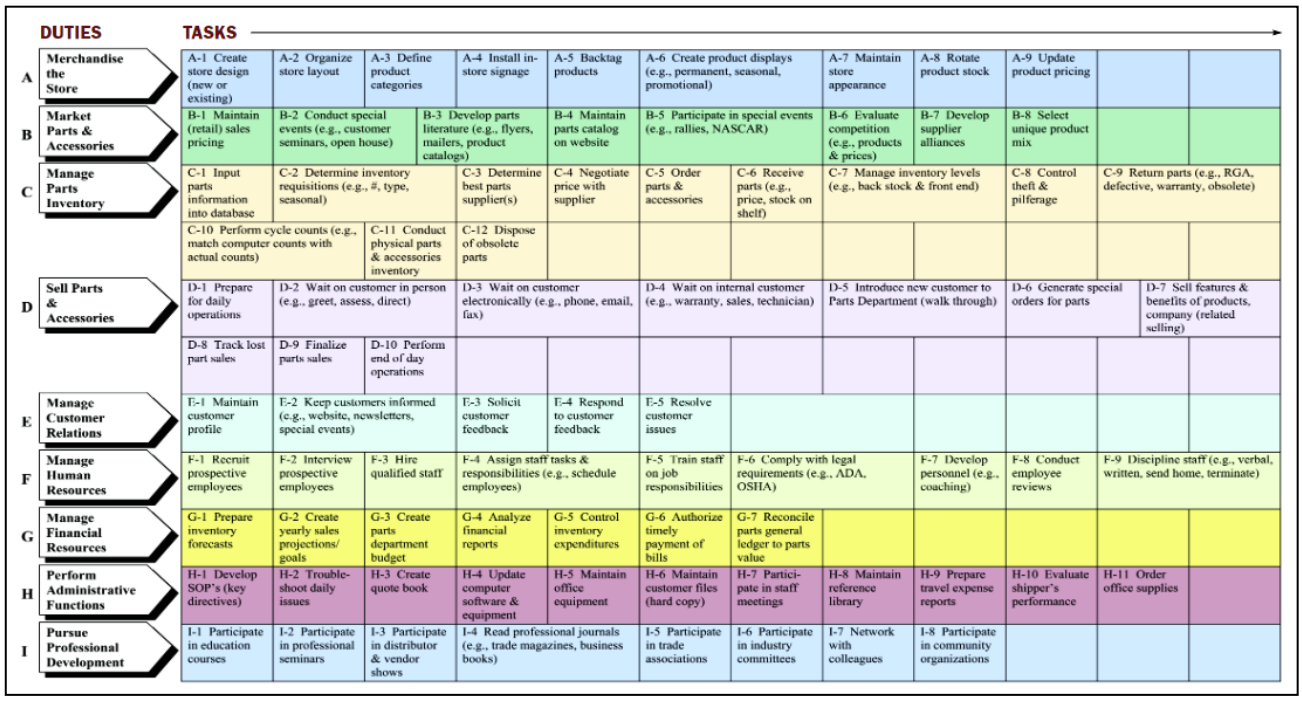
Appendix A

Figure A1

A Sample of DACUM Chart



	DUTIES	TASKS											
A	Merchandise the Store	A-1 Create store design (new or existing)	A-2 Organize store layout	A-3 Define product categories	A-4 Install in-store signage	A-5 Backtag products	A-6 Create product displays (e.g., permanent, seasonal, promotional)		A-7 Maintain store appearance	A-8 Rotate product stock	A-9 Update product pricing		
B	Market Parts & Accessories	B-1 Maintain (retail) sales pricing	B-2 Conduct special events (e.g., customer seminars, open house)	B-3 Develop parts literature (e.g., flyers, mailers, product catalogs)		B-4 Maintain parts catalog on website	B-5 Participate in special events (e.g., rallies, NASCAR)		B-6 Evaluate competition (e.g., products & prices)	B-7 Develop supplier alliances	B-8 Select unique product mix		
C	Manage Parts Inventory	C-1 Input parts information into database	C-2 Determine inventory requisitions (e.g., #, type, seasonal)		C-3 Determine best parts supplier(s)	C-4 Negotiate price with supplier	C-5 Order parts & accessories	C-6 Receive parts (e.g., price, stock on shelf)	C-7 Manage inventory levels (e.g., back stock & front end)		C-8 Control theft & pilferage	C-9 Return parts (e.g., RGA, defective, warranty, obsolete)	
		C-10 Perform cycle counts (e.g., match computer counts with actual counts)		C-11 Conduct physical parts & accessories inventory	C-12 Dispose of obsolete parts								
D	Sell Parts & Accessories	D-1 Prepare for daily operations	D-2 Wait on customer in person (e.g., greet, assess, direct)		D-3 Wait on customer electronically (e.g., phone, email, fax)		D-4 Wait on internal customer (e.g., warranty, sales, technician)		D-5 Introduce new customer to Parts Department (walk through)		D-6 Generate special orders for parts	D-7 Sell features & benefits of products, company (related selling)	
		D-8 Track lost part sales	D-9 Finalize parts sales	D-10 Perform end of day operations									
E	Manage Customer Relations	E-1 Maintain customer profile	E-2 Keep customers informed (e.g., website, newsletters, special events)		E-3 Solicit customer feedback	E-4 Respond to customer feedback	E-5 Resolve customer issues						
F	Manage Human Resources	F-1 Recruit prospective employees	F-2 Interview prospective employees	F-3 Hire qualified staff	F-4 Assign staff tasks & responsibilities (e.g., schedule employees)		F-5 Train staff on job responsibilities	F-6 Comply with legal requirements (e.g., ADA, OSHA)		F-7 Develop personnel (e.g., coaching)	F-8 Conduct employee reviews	F-9 Discipline staff (e.g., verbal, written, send home, terminate)	
G	Manage Financial Resources	G-1 Prepare inventory forecasts	G-2 Create yearly sales projections/ goals	G-3 Create parts department budget	G-4 Analyze financial reports	G-5 Control inventory expenditures	G-6 Authorize timely payment of bills	G-7 Reconcile parts general ledger to parts value					
H	Perform Administrative Functions	H-1 Develop SOP's (key directives)	H-2 Trouble-shoot daily issues	H-3 Create quote book	H-4 Update computer software & equipment	H-5 Maintain office equipment	H-6 Maintain customer files (hard copy)	H-7 Partici-pate in staff meetings	H-8 Maintain reference library	H-9 Prepare travel expense reports	H-10 Evaluate shipper's performance	H-11 Order office supplies	
I	Pursue Professional Development	I-1 Participate in education courses	I-2 Participate in professional seminars	I-3 Participate in distributor & vendor shows	I-4 Read professional journals (e.g., trade magazines, business books)		I-5 Participate in trade associations	I-6 Participate in industry committees	I-7 Network with colleagues	I-8 Participate in community organizations			

Note. DACUM Chart for Parts Manager & Parts Specialist, Rvdaorg, 2019. Retrieved from https://pdf4pro.com/fullscreen/dacum-research-chart-for-service-manager-rvda-289475.html

Appendix B

Survey Questions

1. CTS awareness campaign on CBE/L was substantial and it resulted in spreading enough knowledge on their new education methodology and its anticipated benefits.
2. CTS conducted an effective well-planned awareness campaign on CBE/L initiative before, during, and after its implementation.
3. The availability of supportive Governments' regulations and polices supported your collaboration with CTS to develop CBE/L programs.
4. Public society and workplaces confidence of CBE/L approach increased its chance to succeed.
5. You have coordinated with CTS for the design of the curriculums of various technical subjects.
6. Workplaces's (employer's) engagements in developing CTS curriculums were significant and it enriched its content.
7. Curriculums were developed in coordination with CTS was efficient and served its purpose.
8. Workplaces's engagement in the process of constructing CTS curriculums made them more confident in its graduates.
9. CTS are taking the required actions in respect your OJT comments and reports, which has reflected in enhancing their education programs and their instructors competencies.
10. On-the-job learning (OJL) and coop training programs were very well planned and were executed successfully.
11. On-site learning and coop training made workplaces (employers) more confident in CTS graduates' abilities.

12. CTS instructors are competent in providing their students with the proper theoretical knowledge and required competencies before joining their workplaces after graduation.
13. Your staff were very well trained to coach students who are attached to your workplace for their coop on-site training using (CBE/L) approach.
14. Students' parents and the general society acceptance of CBE/L was a significant success factor for CBE/L implementation.
15. You are providing your coaches with proper facilitations and necessary learning aids, simulators, tools, and equipments, etc.
16. You have provided CTS with the tasks that students or graduates who join your workplace are capable of performing easily or finding difficulties to learn and perform.
17. You have provided CTS with the competencies needed to perform each of the tasks that you assign to entry level workers who are fresh graduate from technical colleges.
18. You have provided CTS with the tasks that you assign to entry level workers who graduate from technical colleges.
19. You have provided the college with the level of competencies that you require for each task you may assign to entry level employees.
20. You have provided CTS with comprehensive reports on student's achievements during their coop on-job practical learning and training.
21. As part of CBE/L program, students working during their on-the- job learning coop programs were successfully learning on-job-tasks' competencies.
22. You have provided CTS with the needed information in respect categorizing assigned tasks to entry level employees as critical or non-critical and hazardous and non-hazardous tasks.
23. You have received the required information from CTS on the new education approach that uses competency-based education as a method of learning.

24. CBE/L graduate students are learning faster than students coming from traditional learning approach.
25. You consider competency-based education and learning (CBE/L) approach graduates more competent even before starting their coop-programs training that previous traditional approach graduates.
26. You are satisfied with CTS graduates' level of competencies and you recommend that other technical colleges follow the steps of CTS and implement CBE/L as well.
27. Graduates from CTS who have been educated using CBE/L approach are reaching your satisfactory performance level faster that students who have been educated using traditional credits-based education.
28. In general, graduates from the old traditional learning and education were not competent and they were not able to perform basic job functions and tasks.
29. Graduates from CTS are performing the tasks that they have learned in college and during on-job coop training at your sites with the required level of competencies.
30. You consider graduates from CTS who joined your workforce in the past four years after the implementation of CBE/L are more competent than before.

After each question a 7-points Likert scale was used:

1	2	3	4	5	6	7
Strongly disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

Appendix C

Table C1

Survey Questions and Their Related Themes

Item #	Q #	ITEM Description (after grouping and sorting)	RQs	Theme
1	2	CTS conducted an effective well-planned awareness campaign on CBE/L initiative before, during, and after its implementation.	RQ1	Awareness and Information Exchange
2	1	CTS awareness campaign on CBE/L was substantial and it resulted in spreading enough knowledge on their new education methodology and its anticipated benefits.	RQ1	
3	23	You have received the required information from CTS on the new education approach that uses competency-based education as a method of learning.	RQ1	
4	3	The availability of supportive Governments' regulations and polices supported your collaboration with CTS to develop CBE/L programs	RQ1	External Acceptance and Gov Polices &Regulations
5	4	Public society and workplaces confidence of CBE/L approach increased its chance to succeed.	RQ1	
6	14	Students' parents and the general society acceptance of CBE/L was a significant success factor for CBE/L implementation.	RQ1	
7	7	The curriculum that was developed in coordination with CTS was efficient and served its purpose.	RQ3 RQ2	Coordinate & Cooperate Curriculums Development
8	6	Workplaces' (employer's) engagements in developing CTS curriculums were significant and it enriched its content.	RQ3 RQ2	
9	8	Workplaces' engagement in the process of constructing CTS curriculums made them more confident in its graduates.	RQ3 RQ2	
10	5	You have coordinated with CTS for the design of the curriculums of various technical subjects.	RQ3 RQ2	
11	11	On-site learning and coop training made workplaces (employers) more confident in CTS graduates' abilities.	RQ4	On the job / On-site coop learning
12	9	CTS are taking the required actions in respect your OJT comments and reports, which has reflected in enhancing their education programs and their instructors' competencies.	RQ4 RQ2	
13	10	On-the-job learning (OJL) and coop training programs were very well planned and were executed successfully.	RQ4	
14	21	As part of CBE/L program, students working during their on-the- job learning coop programs were successfully learning on-job-tasks' competencies.	RQ4 RQ5	
15	20	You have provided CTS with comprehensive reports on student's achievements during their coop on-job practical learning and training.	RQ4	
16	15	You are providing your coaches with proper facilitations and necessary learning aids, simulators, tools, and equipments, etc.	RQ2	Competent CTS Instructors and on job coaches or trainers and Learning aids
17	13	Your staff were very well trained to coach students who are attached to your workplace for their coop on-site training using (CBE/L) approach.	RQ2	
18	12	CTS instructors are competent in providing their students with the proper theoretical knowledge and required competencies before joining their workplaces after graduation.	RQ2	

(Table C1 Continued)

19	18	You have provided CTS with the tasks that you assign to entry level workers who graduate from technical colleges.	RQ2	CTS and workplaces cooperation and collaboration
20	19	You have provided the college with the level of competencies that you require for each task you may assign to entry level employees.	RQ2	
21	22	You have provided CTS with the needed information in respect categorizing assigned tasks to entry level employees as critical or non-critical and hazardous and non-hazardous tasks.	RQ2	
22	16	You have provided CTS with the tasks that students or graduates who join your workplace are capable of performing easily or finding difficulties to learn and perform.	RQ2	
23	17	You have provided CTS with the competencies needed to perform each of the tasks that you assign to entry level workers who are fresh graduate from technical colleges.	RQ2	
24	24	CBE/L graduate students are learning faster than students coming from traditional learning approach.	RQ5 RQ6	Graduates' competencies and workplaces satisfaction in CBE/L
25	25	You consider competency-based education and learning (CBE/L) approach graduates more competent even before starting their coop-programs training that previous traditional approach graduates	RQ5 RQ6	
26	30	You are satisfied with CTS graduates' level of competencies and you recommend that other technical colleges follow the steps of CTS and implement CBE/L as well.	RQ5 RQ6	
27	28	Graduates from CTS are performing the tasks that they have learned in college and during on-job coop training at your sites with the required level of competencies.	RQ3 RQ5 RQ6	
28	29	You consider graduates from CTS who joined your workforce in the past four years after the implementation of CBE/L are more competent than before.	RQ5 RQ6	
29	27	In general, graduates from the old traditional learning and education were not competent and they were not able to perform basic job functions and tasks like CBE/L graduates.	RQ5 RQ6	
30	26	Graduates from CTS who have been educated using CBE/L approach are reaching your satisfactory performance level faster that students who have been educated using traditional credits-based education.	RQ5 RQ6	

Note. This grouping of factors was organized though the outcome of conducting EFA test.

Appendix D

Table D1

Factor Analysis for Survey Items Before Grouping into Constructs (Themes/Factors)

	Component / Factor						
Rotated Component Matrix [a]	**1**	**2**	**3**	**4**	**5**	**6**	**7**
CBE/L graduate students are learning faster than students coming from traditional learning approach.	.798						
You consider competency-based education and learning (CBE/L) approach graduates more competent even before starting their coop-programs training that previous traditional approach graduates	.784						
You are satisfied with CTS graduates' level of competencies and you recommend that other technical colleges follow the steps of CTS and implement CBE/L as well.	.770						
Graduates from CTS are performing the tasks that they have learned in college and during on-job coop training at your sites with the required level of competencies.	.758						
You consider graduates from CTS who joined your workforce in the past four years after the implementation of CBE/L are more competent than before.	.747						
In general, graduates from the old traditional learning and education were not competent and they were not able to perform basic job functions and tasks.	.734						
Graduates from CTS who have been educated using CBE/L approach are reaching your satisfactory performance level faster that students who have been educated using traditional credits-based education.	.638						
On-site learning and coop training made workplaces (employers) more confident in CTS graduates' abilities.		.845					
CTS are taking the required actions in respect your OJT comments and reports, which has reflected in enhancing their education programs and their instructors' competencies.		.838					
On-the-job learning (OJL) and coop training programs were very well planned and were executed successfully.		.823					
Students working during their on-the- job learning coop programs are successfully learning on-job-tasks' competencies.		.798					
You have provided CTS with comprehensive reports on student's achievements during their coop on-job practical learning and training.		.777					
You have provided CTS with the tasks that you assign to entry level workers who graduate from technical colleges.			.844				
You have provided the college with the level of competencies that you require for each task you may assign to entry level employees.			.802				
You have provided CTS with the needed information in respect categorizing assigned tasks to entry level employees as critical or non-critical and hazardous and non-hazardous tasks.			.800				

(Table D1 Continued)

You have provided CTS with the tasks that students or graduates who join your workplace are capable of performing easily or finding difficulties to learn and perform.	.792				
You have provided CTS with the competencies needed to perform each of the tasks that you assign to entry level workers who are fresh graduate from technical colleges.	.769				
The curriculum that was developed in coordination with CTS was efficient and served its purpose.		.791			
Workplaces' (employer's) engagements in developing CTS curriculums were significant and it enriched its content.		.770			
Workplaces' engagement in the process of constructing CTS curriculums made them more confident in its graduates.		.731			
You have coordinated with CTS for the design of the curriculums of various technical subjects.		.702			
You are providing your coaches with proper facilitations and necessary learning aids, simulators, tools, and equipment, etc.			.874		
Your staff were very well trained to coach students who are attached to your workplace for their coop on-site training using (CBE/L) approach			.835		
CTS instructors are competent in providing graduates with the proper theoretical knowledge and required competencies before joining their workplaces after graduation.			.793		
The availability of supportive Governments' regulations and polices supported your collaboration with CTS to develop CBE/L programs				.843	
Public society and workplaces confidence of CBE/L approach increased its chance to succeed.				.830	
Students' parents and the general society acceptance of CBE/L was a significant success factor for CBE/L implementation.				.810	
CTS conducted an effective well-planned awareness campaign on CBE/L initiative before, during, and after its implementation.					.857
CTS awareness campaign on CBE/L was substantial and it resulted in spreading enough knowledge on their new education methodology and its anticipated benefits.					.815
You have received the required information from CTS on the new education approach that uses competency-based education as a method of learning.					.732

Note. Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 5 iterations.

Appendix E

Table E1

Descriptive Analysis of all 7 Factors

Factor / Theme	Test		Statistic	Std. Error
AIEX	Mean		5.8522	.04065
	95% Confidence Interval for	Lower Bound	5.7723	
	Mean	Upper Bound	5.9321	
	5% Trimmed Mean		5.8996	
	Median		6.0000	
	Variance		.730	
	Std. Deviation		.85465	
	Minimum		2.33	
	Maximum		7.00	
	Range		4.67	
	Interquartile Range		1.00	
	Skewness		-.916	.116
	Kurtosis		.513	.232
EGSP	Mean		6.1071	.03880
	95% Confidence Interval for	Lower Bound	6.0308	
	Mean	Upper Bound	6.1833	
	5% Trimmed Mean		6.1828	
	Median		6.3333	
	Variance		.665	
	Std. Deviation		.81563	
	Minimum		3.00	
	Maximum		7.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-1.183	.116
	Kurtosis		1.368	.232
CCCD	Mean		6.1985	.02917
	95% Confidence Interval for	Lower Bound	6.1412	
	Mean	Upper Bound	6.2559	
	5% Trimmed Mean		6.2206	
	Median		6.3750	
	Variance		.376	
	Std. Deviation		.61333	
	Minimum		5.00	

(Table E1 Continued)

	Maximum		7.00	
	Range		2.00	
	Interquartile Range		1.00	
	Skewness		-.704	.116
	Kurtosis		-.657	.232
OLCP	Mean		6.1946	.03554
	95% Confidence Interval for	Lower Bound	6.1247	
	Mean	Upper Bound	6.2644	
	5% Trimmed Mean		6.2424	
	Median		6.4000	
	Variance		.558	
	Std. Deviation		.74722	
	Minimum		4.00	
	Maximum		7.00	
	Range		3.00	
	Interquartile Range		.80	
	Skewness		-1.129	.116
	Kurtosis		.149	.232
CIWC	Mean		6.1176	.03615
	95% Confidence Interval for	Lower Bound	6.0466	
	Mean	Upper Bound	6.1887	
	5% Trimmed Mean		6.1635	
	Median		6.3333	
	Variance		.578	
	Std. Deviation		.76007	
	Minimum		3.00	
	Maximum		7.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.944	.116
	Kurtosis		.407	.232

(Table E1 Continued)

WCWC	Mean		6.1032	.03385
	95% Confidence Interval for	Lower Bound	6.0366	
	Mean	Upper Bound	6.1697	
	5% Trimmed Mean		6.1469	
	Median		6.2000	
	Variance		.506	
	Std. Deviation		.71158	
	Minimum		4.00	
	Maximum		7.00	
	Range		3.00	
	Interquartile Range		1.00	
	Skewness		-.818	.116
	Kurtosis		-.073	.232
CBWS	Mean		6.0527	.03089
	95% Confidence Interval for	Lower Bound	5.9920	
	Mean	Upper Bound	6.1134	
	5% Trimmed Mean		6.0939	
	Median		6.2857	
	Variance		.422	
	Std. Deviation		.64940	
	Minimum		3.71	
	Maximum		7.00	
	Range		3.29	
	Interquartile Range		1.00	
	Skewness		-1.044	.116
	Kurtosis		.095	.232

Note. Source: Author, 2023

Appendix F

Table F1

Factor Analysis Outcome Communalities

	Initial	Extraction
AIEX 1	1.000	.754
AIEX 2	1.000	.679
AIEX 3	1.000	.589
EGSP 1	1.000	.716
EGSP 2	1.000	.688
EGSP 3	1.000	.693
CCCD1	1.000	.510
CCCD2	1.000	.662
CCCD3	1.000	.598
CCCD4	1.000	.551
OLCP 1	1.000	.702
OLCP 2	1.000	.654
OLCP 3	1.000	.729
OLCP 4	1.000	.618
OLCP 5	1.000	.709
CICC 1	1.000	.656
CICC 2	1.000	.711
CICC 3	1.000	.781
WCWC 1	1.000	.719
WCWC 2	1.000	.624
WCWC 3	1.000	.677
WCWC 4	1.000	.656
WCWC 5	1.000	.663
CBWS 1	1.000	.644
CBWS 2	1.000	.596
CBWS 3	1.000	.547
CBWS 4	1.000	.563
CBWS 5	1.000	.571
CBWS 6	1.000	.606
CBWS 7	1.000	.635

Note. Extraction Method: Principal Component Analysis.

Source: Author, 2023

Appendix G

Table G1

Spearman Nonparametric Correlations Tests for all Factors

Spearman's rho Correlations for EGSP

			EGSP 1	EGSP 2	EGSP 3
Spearman's rho	EGSP 1	Correlation Coefficient	1.000	.509**	.553**
		Sig. (2-tailed)	.	.000	.000
		N	440	440	440
	EGSP 2	Correlation Coefficient	.509**	1.000	.499**
		Sig. (2-tailed)	.000	.	.000
		N	440	440	440
	EGSP 3	Correlation Coefficient	.553**	.499**	1.000
		Sig. (2-tailed)	.000	.000	.
		N	440	440	440

Note. **. Correlation is significant at the 0.01 level (2-tailed).

Spearman's rho Correlations for Coord & Coop Curriculum

Spearman's rho		CCCD1	CCCD2	CCCD3	CCCD4
CCCD1	Correlation Coefficient	1.000	.407**	.343**	.369**
	Sig. (2-tailed)	.	.000	.000	.000
	N	440	440	440	440
CCCD2	Correlation Coefficient	.407**	1.000	.498**	.396**
	Sig. (2-tailed)	.000	.	.000	.000
	N	440	440	440	440
CCCD3	Correlation Coefficient	.343**	.498**	1.000	.414**
	Sig. (2-tailed)	.000	.000	.	.000
	N	440	440	440	440
CCCD4	Correlation Coefficient	.369**	.396**	.414**	1.000
	Sig. (2-tailed)	.000	.000	.000	.
	N	440	440	440	440

Note. **. Correlation is significant at the 0.01 level (2-tailed).

Spearman's rho Correlations for OLCP

Spearman's rho		OLCP 1	OLCP 2	OLCP 3	OLCP 4	OLCP 5
OLCP 1	Correlation Coefficient	1.000	.497**	.639**	.475**	.567**
	Sig. (2-tailed)	.	.000	.000	.000	.000
	N	440	440	440	440	440
OLCP 2	Correlation Coefficient	.497**	1.000	.567**	.509**	.565**
	Sig. (2-tailed)	.000	.	.000	.000	.000
	N	440	440	440	440	440
OLCP 3	Correlation Coefficient	.639**	.567**	1.000	.480**	.559**
	Sig. (2-tailed)	.000	.000	.	.000	.000

(Table G1 Continued)

	N	440	440	440	440	440
OLCP 4	Correlation Coefficient	.475**	.509**	.480**	1.000	.484**
	Sig. (2-tailed)	.000	.000	.000	.	.000
	N	440	440	440	440	440
OLCP 5	Correlation Coefficient	.567**	.565**	.559**	.484**	1.000
	Sig. (2-tailed)	.000	.000	.000	.000	.
	N	440	440	440	440	440

Note. **. Correlation is significant at the 0.01 level (2-tailed).

Spearman's rho Correlations for CTS instructors & Coaches Competencies

			CICC 1	CICC 2	CICC 3
Spearman's rho	CICC 1	Correlation Coefficient	1.000	.429**	.547**
		Sig. (2-tailed)	.	.000	.000
		N	440	440	440
	CICC 2	Correlation Coefficient	.429**	1.000	.581**
		Sig. (2-tailed)	.000	.	.000
		N	440	440	440
	CICC 3	Correlation Coefficient	.547**	.581**	1.000
		Sig. (2-tailed)	.000	.000	.
		N	440	440	440

Spearman's rho Correlations for WCWC

Spearman's rho		WCWC 1	WCWC 2	WCWC 3	WCWC 4	WCWC 5
WCWC 1	Correlation Coefficient	1.000	.693**	.550**	.567**	.519**
	Sig. (2-tailed)	.	.000	.000	.000	.000
	N	440	440	440	440	440
WCWC 2	Correlation Coefficient	.693**	1.000	.474**	.478**	.435**
	Sig. (2-tailed)	.000	.	.000	.000	.000
	N	440	440	440	440	440
WCWC 3	Correlation Coefficient	.550**	.474**	1.000	.545**	.634**
	Sig. (2-tailed)	.000	.000	.	.000	.000
	N	440	440	440	440	440
WCWC 4	Correlation Coefficient	.567**	.478**	.545**	1.000	.539**
	Sig. (2-tailed)	.000	.000	.000	.	.000
	N	440	440	440	440	440
WCWC 5	Correlation Coefficient	.519**	.435**	.634**	.539**	1.000
	Sig. (2-tailed)	.000	.000	.000	.000	.
	N	440	440	440	440	440

Spearman's rho Correlations for CBE/L Benefits & Work Satisfaction

Spearman's rho		CBWSaction 1	CBWSaction 2	CBWSaction 3	CBWSaction 4	CBWSaction 5	CBWSaction 6	CBWSaction 7
CBWS 1	Correlation Coefficient	1.000	.515**	.463**	.509**	.526**	.514**	.500**
	Sig. (2-tailed)	.	.000	.000	.000	.000	.000	.000
	N	440	440	440	440	440	440	440
CBWS 2	Correlation Coefficient	.515**	1.000	.368**	.548**	.484**	.428**	.485**
	Sig. (2-tailed)	.000	.	.000	.000	.000	.000	.000
	N	440	440	440	440	440	440	440

(Table G1 Continued)

CBWS 3	Correlation Coefficient	.463**	.368**	1.000	.309**	.426**	.405**	.352**
	Sig. (2-tailed)	.000	.000	.	.000	.000	.000	.000
	N	440	440	440	440	440	440	440
CBWS 4	Correlation Coefficient	.509**	.548**	.309**	1.000	.416**	.468**	.476**
	Sig. (2-tailed)	.000	.000	.000	.	.000	.000	.000
	N	440	440	440	440	440	440	440
CBWS 5	Correlation Coefficient	.526**	.484**	.426**	.416**	1.000	.406**	.481**
	Sig. (2-tailed)	.000	.000	.000	.000	.	.000	.000
	N	440	440	440	440	440	440	440
CBWS 6	Correlation Coefficient	.514**	.428**	.405**	.468**	.406**	1.000	.521**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.	.000
	N	440	440	440	440	440	440	440
CBWS 7	Correlation Coefficient	.500**	.485**	.352**	.476**	.481**	.521**	1.000
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.
	N	440	440	440	440	440	440	440

Note. ** Correlation is significant at the 0.01 level (2-tailed). Source: Author, 2023

Appendix H

CTS 2012 to 2019 Graduates Data

Table H1

CTS 2012 and 2013 Graduates Date

Percentage of CBE/L Grads	No CBE//L Students	Ave. Employ. Waiting Days	Average Grades	Number of Grads	Grad. Years	Major Concentrate	Major	Major Code
		284	82.66	92	2012	Chemical Engineering	Chemical Engineering	101353
		316	84.07	73	2012	Mechanical Engr. Driving Force	Mechanical Engineering	202200
		296	83.12	38	2012	Mech. Engr. Production	Mechanical Engineering	202201
		284	84.28	15	2012	Automobile Mechanics Engr.	Mechanical Engineering	202202
		262	85.32	11	2012	Aircondition & Cooling Mech.	Mechanical Engineering	202203
		308	83.44	32	2012	Marine Mechanics Engr.	Mechanical Engineering	202204
		265	84.66	6	2012	Elect. Instruments Engr.	Electrical Engineering	202205
		272	84.12	12	2012	Elect. Power Transm. & Distrb.	Electrical Engineering	202206
		235	84.78	48	2012	Electronics & Commun Engr.	Electronics Engineering	202207
		374	83.64	46	2012	Civil Construction Engr.	Civil Engineering	202210
		386	86.21	7	2012	Roads Construction Engr.	Civil Engineering	202211
		368	86.38	9	2012	Civil Surveying Engineering	Civil Engineering	202212
		295	82.84	33	2012	Applied Physics	Physics	202215
		238	82.78	25	2012	Applied Chemistry	Chemistry	202216
		175	85.14	33	2012	Petroleum Engr. Exploration	Petroleum Engineering	202217
		162	85.22	24	2012	Petroleum Engr. Prod & Export	Petroleum Engineering	202218
		248	83.75	13	2012	Mech. Engr. Welding & Fabrication	Mechanical Engineering	202220
		146	85.62	54	2012	Refineries Operations Tech.	Refineries Operations Tech.	972314
		191	82.54	9	2012	Chemical Manufacturing Engr.	Chemical Engineering	972319
		288	86.12	88	2012	Computer Engineering	Computer Engineering	972423
0	0	270	84.33	668				
		286	82.51	87	2013	Chemical Engineering	Chemical Engineering	101353
		322	84.12	84	2013	Mechanical Engr. Driving Force	Mechanical Engineering	202200
		289	83.26	42	2013	Mech. Engr. Production	Mechanical Engineering	202201
		288	84.14	18	2013	Automobile Mechanics	Mechanical Engineering	202202
		258	85.12	10	2013	Aircondition & Cooling Mech.	Mechanical Engineering	202203
		310	83.68	23	2013	Marine Mechanics Engr.	Mechanical Engineering	202204
		256	84.52	7	2013	Elect. Instruments Engr.	Electrical Engineering	202205
		264	84.22	8	2013	Elect. Power Transm. & Distrb.	Electrical Engineering	202206
		232	84.53	53	2013	Electronics & Commun Engr.	Electronics Engineering	202207
		354	83.82	49	2013	Civil Construction Engr.	Civil Engineering	202210
		367	86.08	16	2013	Roads Construction Engr.	Civil Engineering	202211
		352	86.02	15	2013	Civil Surveying Engineering	Civil Engineering	202212
		284	83.04	22	2013	Applied Physics	Physics	202215
		245	82.98	35	2013	Applied Chemistry	Chemistry	202216
		172	85.02	28	2013	Petroleum Engr. Exploration	Petroleum Engineering	202217
		168	85.12	34	2013	Petroleum Engr. Prod & Export	Petroleum Engineering	202218
		262	83.56	8	2013	Mech. Engr. Welding & Fabrication	Mechanical Engineering	202220
		148	85.28	52	2013	Refineries Operations Tech.	Refineries Operations Tech.	972314
		196	82.72	12	2013	Chemical Manufacturing Eng.	Chemical Engineering	972319
		275	85.46	81	2013	Computer Engineering	Computer Engineering	972423
0	0	266	84.26	684				

Note. Source: Author, 2024

Table H2

CTS 2014 and 2015 Graduates Data

Percentage of CBE/L Grads	No CBE//L Students	Ave. Employ. Waiting Days	Average Grades	Number of Grads	Grad. Years	Major Concentrate	Major	Major Code
24%	28	264	83.44	118	2014	Chemical Engineering	Chemical Engineering	101353
28%	24	302	83.86	85	2014	Mechanical Engr. Driving Force	Mechanical Engineering	202200
25%	20	268	83.32	79	2014	Mech. Engr. Production	Mechanical Engineering	202201
23%	5	262	84.28	22	2014	Automobile Mechanics	Mechanical Engineering	202202
23%	3	238	85.32	13	2014	Air-Condition & Cooling Mech.	Mechanical Engineering	202203
27%	4	288	83.44	15	2014	Marine Mechanics Engr.	Mechanical Engineering	202204
25%	2	239	84.46	8	2014	Elect. Instruments Engr.	Electrical Engineering	202205
22%	2	248	84.12	9	2014	Elect. Power Transm. & Distrb.	Electrical Engineering	202206
31%	15	215	84.78	49	2014	Electronics & Commun Engr.	Electronics Engineering	202207
21%	7	332	83.64	33	2014	Civil Construction Engr.	Civil Engineering	202210
31%	5	348	86.21	16	2014	Roads Construction Engr.	Civil Engineering	202211
24%	4	328	86.38	17	2014	Civil Surveying Engineering	Civil Engineering	202212
22%	5	265	82.84	23	2014	Applied Physics	Physics	202215
29%	6	238	82.95	21	2014	Applied Chemistry	Chemistry	202216
26%	5	158	85.14	19	2014	Petroleum Engr. Exploration	Petroleum Engineering	202217
24%	8	154	85.22	34	2014	Petroleum Engr. Prod & Export	Petroleum Engineering	202218
22%	2	241	83.76	9	2014	Mech. Engr. Welding & Fabrication	Mechanical Engineering	202220
43%	41	137	85.62	95	2014	Refineries Operations Tech.	Refineries Operations Tech.	972314
24%	4	166	82.64	17	2014	Chemical Manufacturing Tech.	Chemical Engineering	972319
27%	30	242	86.12	112	2014	Computer Engineering	Computer Engineering	972423
28%	220	247	84.38	794				
52%	48	247	84.77	92	2015	Chemical Engineering	Chemical Engineering	101353
45%	42	283	84.16	93	2015	Mechanical Engr. Driving Force	Mechanical Engineering	202200
52%	32	246	83.62	61	2015	Mech. Engr. Production	Mechanical Engineering	202201
53%	23	242	84.64	43	2015	Automobile Mechanics	Mechanical Engineering	202202
55%	12	221	85.82	22	2015	Air-Condition & Cooling Mech.	Mechanical Engineering	202203
44%	14	265	84.28	32	2015	Marine Mechanics Engr.	Mechanical Engineering	202204
63%	5	213	84.70	8	2015	Elect. Instruments Engr.	Electrical Engineering	202205
56%	10	229	84.25	18	2015	Elect. Power Transm. & Distrb.	Electrical Engineering	202206
60%	31	196	84.96	52	2015	Electronics & Commun Engr.	Electronics Engineering	202207
56%	24	305	83.84	43	2015	Civil Construction Engr.	Civil Engineering	202210
56%	9	317	86.44	16	2015	Roads Construction Engr.	Civil Engineering	202211
53%	17	297	86.52	32	2015	Civil Surveying Engineering	Civil Engineering	202212
61%	11	247	83.12	18	2015	Applied Physics	Physics	202215
57%	17	229	83.18	30	2015	Applied Chemistry	Chemistry	202216
53%	44	142	85.43	83	2015	Petroleum Engr. Exploration	Petroleum Engineering	202217
54%	35	144	85.78	65	2015	Petroleum Engr. Prod & Export	Petroleum Engineering	202218
55%	6	223	84.72	11	2015	Mech. Engr. Welding & Fabrication	Mechanical Engineering	202220
65%	94	126	86.25	145	2015	Refineries Operations Tech.	Refineries Operations Tech.	972314
50%	11	149	83.39	22	2015	Chemical Manufacturing Tech.	Chemical Engineering	972319
49%	42	229	86.67	85	2015	Computer Engineering	Computer Engineering	972423
54%	527	228	84.83	971				

Note. Source: Author, 2024

Table H3

CTS 2016 and 2017 Graduates Data

Percentage of CBE/L Grads	No CBE//L Students	Ave. Employ. Waiting Days	Average Grades	Number of Grads	Grad. Years	Major Concentrate	Major	Major Code
85%	92	218	85.21	108	2016	Chemical Engineering	Chemical Engineering	101353
83%	81	231	84.67	98	2016	Mechanical Engr. Driving Force	Mechanical Engineering	202200
85%	66	218	84.14	78	2016	Mech. Engr. Production	Mechanical Engineering	202201
78%	31	212	85.06	40	2016	Automobile Mechanics	Mechanical Engineering	202202
79%	22	193	86.17	28	2016	Air-Condition & Cooling Mech.	Mechanical Engineering	202203
78%	38	231	84.65	49	2016	Marine Mechanics Engr.	Mechanical Engineering	202204
73%	8	183	85.41	11	2016	Elect. Instruments Engr.	Electrical Engineering	202205
75%	12	192	84.71	16	2016	Elect. Power Transm. & Distrb.	Electrical Engineering	202206
86%	57	167	85.54	66	2016	Electronics & Commun Engr.	Electronics Engineering	202207
84%	49	263	84.14	58	2016	Civil Construction Engr.	Civil Engineering	202210
76%	13	278	86.57	17	2016	Roads Construction Engr.	Civil Engineering	202211
76%	26	253	86.79	34	2016	Civil Surveying Engineering	Civil Engineering	202212
71%	12	197	83.58	17	2016	Applied Physics	Physics	202215
81%	25	168	83.66	31	2016	Applied Chemistry	Chemistry	202216
87%	75	125	85.77	86	2016	Petroleum Engr. Exploration	Petroleum Engineering	202217
91%	73	128	86.15	80	2016	Petroleum Engr. Prod & Export	Petroleum Engineering	202218
80%	12	187	84.90	15	2016	Mech. Engr. Welding & Fabrication	Mechanical Engineering	202220
85%	153	104	86.62	179	2016	Refineries Operations Tech.	Refineries Operations Tech.	972314
71%	15	128	83.74	21	2016	Chemical Manufacturing Tech.	Chemical Engineering	972319
74%	64	198	86.81	86	2016	Computer Engineering	Computer Engineering	972423
83%	924	194	85.21	1,118				
		184	85.48	110	2017	Chemical Engineering	Chemical Engineering	101353
		192	84.81	106	2017	Mechanical Engr. Driving Force	Mechanical Engineering	202200
		185	84.55	66	2017	Mech. Engr. Production	Mechanical Engineering	202201
		159	85.27	32	2017	Automobile Mechanics	Mechanical Engineering	202202
		162	86.03	55	2017	Air-Condition & Cooling Mech.	Mechanical Engineering	202203
		195	84.89	32	2017	Marine Mechanics Engr.	Mechanical Engineering	202204
		152	85.36	12	2017	Elect. Instruments Engr.	Electrical Engineering	202205
		155	84.89	12	2017	Elect. Power Transm. & Distrb.	Electrical Engineering	202206
		145	85.77	60	2017	Electronics & Commun Engr.	Electronics Engineering	202207
		204	84.68	74	2017	Civil Construction Engr.	Civil Engineering	202210
		211	86.52	11	2017	Roads Construction Engr.	Civil Engineering	202211
		198	86.45	36	2017	Civil Surveying Engineering	Civil Engineering	202212
		164	83.64	18	2017	Applied Physics	Physics	202215
		144	83.73	38	2017	Applied Chemistry	Chemistry	202216
		119	86.14	80	2017	Petroleum Engr. Exploration	Petroleum Engineering	202217
		122	86.43	88	2017	Petroleum Engr. Prod & Export	Petroleum Engineering	202218
		167	85.23	16	2017	Mech. Engr. Welding & Fabrication	Mechanical Engineering	202220
			86.78	188	2017	Refineries Operations Tech.	Refineries Operations Tech.	972314
		119	84.39	31	2017	Chemical Manufacturing Tech.	Chemical Engineering	972319
		168	87.11	92	2017	Computer Engineering	Computer Engineering	972423
			86.92	86	2017	Manufacturing Technology	Industrial Engineering	980443
100%	1,243	166	85.48	1,243				

Note. Source: Author, 2024

Table H4

CTS 2018 and 2019 Graduates Data

Percentage of CBE/L Grads	No CBE//L Students	Ave. Employ. Waiting Days	Average Grades	Number of Grads	Grad. Years	Major Concentrate	Major	Major Code
		172	85.82	112	2018	Chemical Engineering	Chemical Engineering	101353
		183	85.35	115	2018	Mechanical Engr. Driving Force	Mechanical Engineering	202200
		176	84.82	78	2018	Mech. Engr. Production	Mechanical Engineering	202201
		148	85.49	35	2018	Automobile Mechanics	Mechanical Engineering	202202
		155	86.88	44	2018	Air-Condition & Cooling Mech.	Mechanical Engineering	202203
		183	85.22	43	2018	Marine Mechanics Engr.	Mechanical Engineering	202204
		145	85.96	20	2018	Elect. Instruments Engr.	Electrical Engineering	202205
		141	85.47	11	2018	Elect. Power Transm. & Distrb.	Electrical Engineering	202206
		136	86.08	61	2018	Electronics & Commun Engr.	Electronics Engineering	202207
		192	84.81	71	2018	Civil Construction Engr.	Civil Engineering	202210
		197	86.33	21	2018	Roads Construction Engr.	Civil Engineering	202211
		188	86.25	24	2018	Civil Surveying Engineering	Civil Engineering	202212
		156	83.88	25	2018	Applied Physics	Physics	202215
		136	83.96	49	2018	Applied Chemistry	Chemistry	202216
		114	86.14	85	2018	Petroleum Engr. Exploration	Petroleum Engineering	202217
		111	86.46	53	2018	Petroleum Engr. Prod & Export	Petroleum Engineering	202218
		155	85.39	33	2018	Mech. Engr. Welding & Fabrication	Mechanical Engineering	202220
			86.54	203	2018	Refineries Operations Tech.	Refineries Operations Tech.	972314
		112	84.61	35	2018	Chemical Manufacturing Tech.	Chemical Engineering	972319
		157	87.21	102	2018	Computer Engineering	Computer Engineering	972423
			86.69	87	2018	Manufacturing Technology	Industrial Engineering	980443
100%	1,307	156	85.68	1,307				
		167	85.76	118	2019	Chemical Engineering	Chemical Engineering	101353
		178	85.46	102	2019	Mechanical Engr. Driving Force	Mechanical Engineering	202200
		165	84.73	32	2019	Mech. Engr. Production	Mechanical Engineering	202201
		146	85.61	57	2019	Automobile Mechanics	Mechanical Engineering	202202
		151	86.84	36	2019	Air-Condition & Cooling Mech.	Mechanical Engineering	202203
		175	85.41	52	2019	Marine Mechanics Engr.	Mechanical Engineering	202204
		138	85.74	16	2019	Elect. Instruments Engr.	Electrical Engineering	202205
		138	85.63	10	2019	Elect. Power Transm. & Distrb.	Electrical Engineering	202206
		137	86.25	70	2019	Electronics & Commun Engr.	Electronics Engineering	202207
		174	84.81	76	2019	Civil Construction Engr.	Civil Engineering	202210
		185	86.33	20	2019	Roads Construction Engr.	Civil Engineering	202211
		177	86.25	24	2019	Civil Surveying Engineering	Civil Engineering	202212
		152	83.67	34	2019	Applied Physics	Physics	202215
		139	83.74	55	2019	Applied Chemistry	Chemistry	202216
		115	86.44	90	2019	Petroleum Engr. Exploration	Petroleum Engineering	202217
		113	86.63	82	2019	Petroleum Engr. Prod & Export	Petroleum Engineering	202218
		147	85.31	41	2019	Mech. Engr. Welding & Fabrication	Mechanical Engineering	202220
			86.75	192	2019	Refineries Operations Tech.	Refineries Operations Tech.	972314
		115	84.58	32	2019	Chemical Manufacturing Tech.	Chemical Engineering	972319
		149	87.45	114	2019	Computer Engineering	Computer Engineering	972423
			86.78	98	2019	Manufacturing Technology	Industrial Engineering	980443
100%	1,351	151	85.72	1,351				

Note. Source: Author, 2024

Appendix I

PAAET Agreement with Kuwait Society of Engineers

اتفاقية بين جمعية المهندسين الكويتية والهيئة

العامة للتعليم التطبيقي والتدريب

26 مايو 2023

البند الأول: التمهيد السابق جزء لا يتجزأ من هذه الاتفاقية ومكمل لبنودها.

البند الثاني:

نطاق التعاون:

تغطي هذه الاتفاقية التعاون والعمل المشترك بين طرفيها من خلال تبادل الخبرات بين الطرفين بحيث يعمل على تطوير آليات العمل والأنشطة المشتركة بين الطرفين وذلك من خلال الجمعية والهيئة ومراكزها التعليمية في كافة المجالات العلمية والعملية بما في ذلك الأنشطة الثقافية والاجتماعية التي تقوم بها الجمعية أو الهيئة للأعضاء المهندسين من المنتمين للطرفين.

البند الثالث: تقدم الجمعية المهندسين من أعضاء الهيئة كافة الخدمات التي يتمتع بها أعضائها من خلال لجان الجمعية في كافة المجالات الفنية والثقافية والعلمية بما في ذلك الأنشطة الرياضية والاجتماعية. في المقابل على الهيئة أن تشرك الجمعية فيما تقوم به من أنشطة في المجلات السابق ذكرها مع مراعاة أن يكون التعاون المشترك بينهما بما يحقق مصلحة للطرفين ويدعم الخدمات التي تقدم للأعضاء من الجانين وفي إطار الأهداف العامة لكل طرف.

البند الرابع: يتبادل الطرفان المطبوعات، والبرامج والخطط التعليمية، والمراجع البيبليوغرافية، والمعارف، والمواد الإعلامية وغيرها من المواد التي تسهم في تحقيق الأهداف الأكاديمية للطرفان.

البند الخامس: يتمتع المهندسين من الأعضاء في الهيئة بكافة الامتيازات التي يتمتع بها أعضاء الجمعية فيحق لهم الاشتراك في برنامج الضمان الصحي للمهندسين وذلك حسب بنود اتفاقية المنعقدة بين الجمعية

والجهة القائمة على هذا المشروع كما يتمتع المهندسين من أعضاء الطرف الثاني (الهيئة العامة للتعليم التطبيقي) بالخصومات والامتيازات التي يقدمها الطرف الأول (جمعية المهندسين الكويتية) لأعضائها.

البند السادس: اعتراف الطرف الثاني من هذه الاتفاقية (الهيئة العامة للتعليم التطبيقي والتدريب) بالشهادات التي يحصل عليها المهندسين من أعضاء هيئة التدريس والتدريب لديه عن الدورات العلمية والتدريبية التي يشاركون فيها والتي يعقدها الطرف الأول (جمعية المهندسين الكويتية). والعمل بمقتضاها وتعرض هذه الشهادات على اللجان المختصة بالهيئة لاعتمادها عند تقديمها حالة ترقيات أعضاء هيئة التدريس والتدريب لديها.

البند السابع: تعمل هذه الاتفاقية على الارتقاء بالأعضاء المنتمين لطرفيها خاصة في البرامج العلمية والدورات التدريبية والمهام العلمية التي يشارك فيها الأعضاء من الطرفين وينظمها أي منهما، علاوة على توفير وفرص للطرفين لحضور المؤتمرات والندوات العلمية سالفة الذكر. وكلك المشاركة في الاحتفالات والمناسبات العلمية التي ينظمها كل من طرف منهما. واعداد دورات تدريبية مشتركة وندوات علمية بما يحقق الجودة والاستفادة الفعلية وتحقيق المنفعة للطرفين.

البند الثامن: للطرف الثاني الاستفادة من قاعات التدريب في الجمعية وعقد الدورات التدريبية والندوات العلمية والأنشطة الخاصة به وللطرف الأول دعمه ومساعدته في ذلك بما لا يتعارض مع مصلحة الطرف الأول وخطط العمل السنوية الخاصة بالطرف الأول وحسب النظام المتبع والمعمول به والخاص بنظام العمل وقاعات ومقرات الطرف الأول (جمعية المهندسين الكويتية).

البند التاسع: يتعاون الطرفان على تدريب وتأهيل المهن المساندة وذات الصلة بالبرامج التأهيلية المناسبة وعقد الاختبارات لهم.

البند العاشر: يقوم الطرف الأول من هذا العقد بتزويد الطرف الثاني بما لديه من معلومات عن الجامعات التي تمنح شهادة البكالوريوس في الهندسة والمقبولة لديه خاصة في الدول الأجنبية ويلتزم الطرف الثاني بتزويد الطرف الأول بما لديه من معلومات في هذا الشأن.

البند الحادي عشر: التوقيع على هذه الاتفاقية لا يمنع من القيام بأنشطة أخرى تعزز التعاون المشترك بالتشاور بين الطرفين مستقبلا وبما يحقق المصلحة المشتركة لهما.

البند الثاني عشر: تعتبر هذه الاتفاقية سارية من تاريخ اعتمادها من قبل الطرفين، وتجدد تلقائياً كل خمس سنوات مالم يتقدن أي من الطرفين للطرف الآخر بطلب كتابي يبدي فيه رغبته بعدم تجديدها قبل انتهاء مدتها أو أي مدة مجددة.

عن/ جمعية المهندسين الكويتية والهيئة عن/ الهيئة العامة للتعليم التطبيقي والتدريب

English Translation:

Agreement between the Kuwait Society of Engineers and the Public Authority For Applied Education and Training (PAAET)

May 26, 2023

The first clause: The previous preamble is an integral part of this agreement and complements its provisions.

Clause Two:

Scope of cooperation:

This agreement covers cooperation and joint work between its two parties through the exchange of experiences between the two parties, with work to develop work mechanisms and joint activities between the two parties, through the association and the authority and its educational centers in all scientific and practical fields, including cultural and social activities carried out by the association or the authority for engineer members. From those belonging to both parties.

Clause Three: The Association provides engineers who are members of the Authority with all the services that its members enjoy through the Association's committees in all artistic, cultural and scientific fields, including sports and social activities. In return, the Authority must involve the association in its activities in the aforementioned magazines, taking into account that joint cooperation between them is in the interest of both parties and supports the services provided to members from both sides and within the framework of the general objectives of each party.

Clause Four: The two parties will exchange publications, educational programs and plans, bibliographic references, knowledge, media materials and other materials that contribute to achieving the academic goals set by the two parties.

Clause Five: Engineers who are members of the Authority enjoy all the privileges enjoyed by members of the Association. They are entitled to participate in the health insurance program for engineers, according to the terms of the agreement concluded between the Association and the entity in charge of this project. Engineers who are members of the second party (the

Public Authority for Applied Education) also enjoy discounts. And the privileges provided by the first party (Kuwait Society of Engineers) to its members.

Clause Six: Recognition by the second party of this agreement (the Public Authority for Applied Education and Training) of the certificates that engineers obtain from its teaching and training staff members for the scientific and training courses in which they participate and which are held by the first party (the Kuwaiti Society of Engineers). These certificates will be presented to the relevant committees of the Authority for approval when submitting the status of promotions and training of its faculty members.

Clause Seven: This agreement works to advance the members of both parties, especially in scientific programs, training courses, and scientific tasks in which members from both parties participate and are organized by either party, in addition to providing opportunities for both parties to attend the aforementioned scientific conferences and seminars. You may participate in scientific celebrations and events organized by each party. Preparing joint training courses and scientific seminars to achieve quality, actual benefit and benefit for both parties.

Clause Eight: The Second Party has the right to benefit from the association's training halls and hold training courses, scientific seminars, and its own activities, and the First Party has the right to support and assist in this in a manner that does not conflict with the interest of the First Party and the annual work plans of the First Party and in accordance with the applicable and applicable system of work and the halls and headquarters of the First Party. (Kuwait Society of Engineers).

Clause Nine: The two parties will cooperate to train and qualify supporting professions related to appropriate qualification programs and hold tests for them.

Clause Ten: The first party to this contract shall provide the second party with the information it has about the universities that grant a bachelor's degree in engineering and are accepted by it, especially in foreign countries. The second party is obligated to provide the first party with the information it has in this regard.

Clause Eleven: Signing this agreement does not prevent the carrying out of other activities that enhance joint cooperation in consultation between the two parties in the future and in a way that achieves their common interest.

Clause Twelve: This agreement is considered valid from the date of its approval by both parties, and is automatically renewed every five years unless either party submits to the other party a written request expressing its desire not to renew it before the expiry of its term or any renewed term.

For/ The Public Authority for Applied Education and Training

For/ Kuwait Society of Engineers

Appendix J

CTS Agreement with Kuwait Society for Inventors Support

مذكرة تفاهم بين الهيئة العامة للتعليم التطبيقي والتدريب

و

الجمعية الكويتية لدعم المخترعين والابتكار

من أجل تحقيق تعاون مثمر بين الهيئة العامة للتعليم التطبيقي والتدريب والجمعية الكويتية لدعم المخترعين والابتكار في مجال تشجيع الاختراعات وتطوير الأفكار المبدعة لدى طلبة وطالبات كليات ومعاهد الهيئة العامة للتعليم التطبيقي والتدريب، فقد اتفق الطرفان بتاريخ ..... على ما يلي:

الهيئة العامة للتعليم التطبيقي والبحوث ويمثلها الدكتور / حسن محمد الفجام - مدير عام ويشار إليها فيما بعد "الطرف الأول أو الهيئة، وعنوانها: الشويخ التعليمية - الحرم التطبيقي، دولة الكويت.

الجمعية الكويتية لدعم المخترعين والابتكار ويمثلها الدكتورة / فاطمة سالم الثلاب - رئيسة الجمعية الكويتية لدعم المخترعين والابتكار ويشار إليها فيما بعد "الطرف الثاني" أو الجمعية وعنوانها: الكويت - المنطقة الحرة.

تمهيد:

تعتبر الهيئة العامة للتعليم التطبيقي والتدريب هيئة أكاديمية تسعى إلى تحقيق رسالتها التي أنشئت من أجلها وهي توفير قوة العمل الفنية الوطنية الملبية لمتطلبات التنمية الاجتماعية والاقتصادية في البلاد كما ونوعا وتتيح إمكانية قبول جميع المتقدمين من الشباب الكويتي للالتحاق بمختلف مسارات التعليم التطبيقي والتدريب وينبثق منها عدة كليات ومعاهد تطبيقية تعمل في مجال تطوير التعليم في دولة الكويت ومن أهدافها :

الربط بين العلوم والتكنولوجيا في جميع المجالات.

مواكبة المستجدات العلمية في مجال التكنولوجيا والتقنية المتطورة.

دعم الإبداع والابتكار والتطوير.

إضفاء التفاعلية في التعليم.

نشر ثقافة الصناعة.

خلق روح التنافس وتشجيع التعلم التعاوني

المساهمة الفاعلة في البحث العلمي.

تعزيز التعاون المشترك بين الجهات لرفع مستوى مخرجات التعليم في دولة الكويت.

وحيث ان الجمعية الكويتية لدعم المخترعين والابتكار هي جمعية نفع عام اشهرت بموجب القرار الوزاري رقم (29/1) لسنة 2016 بهدف الاهتمام بالمخترعين الكويتيين وتطويرهم في مجال الاختراع بما يحقق لهم وللكويت مكانة مرموقة في المجتمعات العلمية المتخصصة واعتبار المخترع

الكويتي من اهم روافد الاقتصاد المستقبلية.

وإيمانا من الطرفين بأهمية مبدأ التعاون المشترك وبناء شراكات متميزة رغبة منهما في تقوية تعاونهما الثنائي بما يحقق الصالح العام في مجال تنمية وتطوير التعليم واستثمار التكنولوجيا والخبرات المتبادلة والمعرفة فلقد تم الاتفاق على تحديد إطار للتفاهم حول هذا الموضوع وفقا لما يلي:

(المادة الأولى - التمهيد)

يعتبر التمهيد السابق جزء لا يتجزأ من هذه المذكرة.

(المادة الثانية: مجالات التعاون)

التعاون بين الطرف الأول والطرف الثاني على توفير مكاتب وقاعة دراسية وورشة في كلية الدراسات التكنولوجية على أن يتم تسميتهم باسم "الاختراعات والابتكارات".

يتعاون الطرفان فيما بينهم بتوفير كامل الاحتياجات الفنية والبشرية لتجهيز المكاتب والورشة والقاعة على سبيل المثال:

تجهيز المكاتب والقاعة والورشة بالتجهيزات الأساسية.

توفير المعدات والأجهزة اللازمة.

توفير نماذج للاختراعات المحلية.

تقديم استشارات فنية ولقاءات تنويرية.

صيانة المعدات والأجهزة.

(المادة الثالثة: دور الطرف الأول)

يتلخص الهيئة العامة للتعليم التطبيقي والتدريب الأول في الآتي:

توفير ورشة في كلية الدراسات التكنولوجية لاستخدام الطرف الثاني مع توفير طاولات عمل وإضاءة مناسبة.

توفير 15 جهاز حاسوب داخل قاعة دراسية مع توفير متطلبات تشغيل أجهزة الكمبيوتر من كهرباء وطاولات وإضاءة مناسبة وجهاز عرض علوي (Data show).

تزويد أجهزة الحاسوب ببرنامج رسم هندسي SolidWorks.

توفير عدد 2 مكاتب بجانب الورشة والقاعة ووضع لوحة على الورشة والقاعة والمكاتب باسم (الجمعية الكويتية لدعم المخترعين).

ترشيح فريق عمل من أعضاء هيئة التدريس بالكلية لمتابعة تنفيذ بنود هذه المذكرة.

(المادة الرابعة: دور الطرف الثاني)

يتلخص دور الجمعية الكويتية لدعم المخترعين والابتكار في الآتي:

توفير نماذج لجميع الاختراعات المحلية وعرضها داخل الورشة.

توفير عدد 10 طابعات ثلاثية الأبعاد لعمل النماذج.

تقديم التدريب على الرسم الهندسي لجميع طلبة الكلية المرشحين من الأقسام العلمية.

مساعدة طلبة المشاريع لجميع الأقسام العلمية على تصنيع نماذج ثلاثية الأبعاد.

تقديم استشارات فنيه ومساعدة الطلبة في البحث المبدئي وصياغة الاختراع وتطويره برسوم رمزية.

إقامة الدورات المتعلقة في كيفية عمل الاختراعات لجميع طلبة الكلية.

البحث المبدئي لأعضاء هيئة التدريس والطلبة والنظر في مشاريعهم إذا كانت ترتقي الى مرحلة براءة اختراع.

تقديم الدورات التدريبية الخاصة بالاختراعات والحماية الفكرية للطلبة.

إقامة لقاءات تنويرية لجميع طلبة الكلية لتحفيزهم على التوجه العلمي.

تقديم عضوية في الجمعية الكويتية لدعم المخترعين والابتكار لأعضاء هيئة التدريس والتدريب والطلبة بأسعار مخفضة.

إصدار مجلة علمية دورية باختراعات وابتكارات الطلبة وأعضاء هيئة التدريس والتدريب.

المشاركة في المعرض السنوي للجمعيات العلمية في الهيئة لدعم الحركة الابتكارية وتوفير المحكمين في حال احتاج الأمر لتحكيم للاختراعات.

(المادة الخامسة: أولويات التعاون)

يقوم الطرفان بإنجاز التعاون المنشود وفقا لهذه المذكرة وفي حدود مسئولياتهما وأولوياتهما وفي إطار القوانين والأنظمة واللواح للطرفين.

(المادة السادسة مدة الاتفاقية)

يبدأ العمل بهذه المذكرة من تاريخ توقيعها ولمدة سنة واحدة وتجدد تلقائيا مالم يعلن أحد الطرفين الآخر برغبته بإنهاء أو تعديل الاتفاق جزئيا أو كليا قبل انقضائه أو انقضاء أي تمديد له بمدة شهر على الأقل.

(المادة السابعة: نسخ الاصلية للمذكرة)

تم عمل نسختين أصليتين من هذه المذكرة لكل طرف نسخة للعمل بموجبها.

الطرف الأول
الهيئة العامة للتعليم التطبيقي والتدريب

الطرف الثاني
الجمعية الكويتية لدعم المخترعين والابتكار

A Copy of The English Translation:

Memorandum of understanding between the Public Authority for Applied Education and Training And Kuwait Society for Supporting Inventors and Innovation

In order to achieve fruitful cooperation between the Public Authority for Applied Education and Training and the Kuwaiti Society for Supporting Inventors and Innovation in the field of encouraging inventions and developing creative ideas among male and female students in colleges and institutes of the Public Authority for Applied Education and Training, the two parties agreed on ……. ..... As follows:

1. The Public Authority for Applied Education and Research, represented by Dr. Hassan Mohammad Al-Fahham - General Director, hereinafter referred to as "the first party or the Authority," and its address: Shuwaikh Educational Campus - Applied Campus, State of Kuwait.

2. The Kuwaiti Society for Supporting Inventors and Innovation, represented by Dr. Fatima Salem Al-Thallab - President of the Kuwaiti Society for Supporting Inventors and Innovation, hereinafter referred to as the "Second Party" or the Society, whose address is: Kuwait - Free Zone.

Introduction:

The Public Authority for Applied Education and Training is an academic body that seeks to achieve its mission for which it was established, which is to provide a national technical workforce that meets the requirements of social and economic development in the country in terms of quantity and quality, and provides the possibility of accepting all Kuwaiti youth applicants to join the various tracks of applied education and training, from which several colleges and institutes emerge. An applied application that works in the field of developing education in the State of Kuwait, and its objectives include:

1. Linking science and technology in all fields.

2. Keeping up with scientific developments in the field of technology and advanced technology.

3. Supporting creativity, innovation and development.

4. Adding interactivity to education.

5. Spreading industry culture.

6. Create a spirit of competition and encourage cooperative learning.

7. Active contribution to scientific research.

8. Strengthening joint cooperation between entities to raise the level of educational outcomes in the State of Kuwait.

Whereas the Kuwaiti Society for Supporting Inventors and Innovation is a public benefit society established pursuant to Ministerial Resolution No. (29/1) of 2016 with the aim of paying attention to Kuwaiti inventors and developing them in the field of invention in a way that achieves for them and Kuwait a prominent position in specialized scientific communities and the consideration of the inventor.

Kuwait is one of the most important tributaries of the future economy.

Based on the belief of both parties in the importance of the principle of joint cooperation and building distinguished partnerships, and their desire to strengthen their bilateral cooperation in a way that achieves the common good in the field of developing and developing education and investing in technology, mutual experiences and knowledge, it was agreed to define a framework of understanding on this subject according to the following:

(Article One - Preamble)

The previous preamble is an integral part of this memorandum.

(Article Two: Areas of Cooperation)

Cooperation between the first party and the second party to provide offices, a classroom, and a workshop in the College of Technological Studies, to be named "Inventions and Innovations."

The two parties will cooperate with each other to provide all the technical and human needs to equip the offices, workshop, and hall, for example:

Equipping the offices, hall and workshop with basic equipment.

Providing the necessary equipment and devices.

Providing models for local inventions.

Providing technical consultations and enlightening meetings.

Maintenance of equipment and devices.

(Article Three: Role of the First Party)

The General Authority for Applied Education and Training I is summarized as follows:

Providing a workshop in the College of Technological Studies for the use of the second party, along with providing work tables and appropriate lighting.

Providing 15 computers inside a classroom, along with providing the requirements for operating the computers, including electricity, tables, appropriate lighting, and an overhead projector (Data show).

Providing computers with SolidWorks engineering drawing program.

Providing 2 offices next to the workshop and hall, and placing a sign on the workshop, hall and offices with the name (Kuwait Society for Supporting Inventors).

Nominate a working team of faculty members at the college to follow up on the implementation of the provisions of this memorandum.

(Article Four: Role of the Second Party)

The role of the Kuwaiti Society for Supporting Inventors and Innovation is as follows:

Providing models of all local inventions and displaying them inside the workshop.

Providing 10 3D printers to make models.

Providing training on engineering drawing for all college students nominated from scientific departments.

Helping project students in all scientific departments to manufacture three-dimensional models.

Providing technical consultations and assisting students in initial research, formulation and development of the invention for a nominal fee.

Holding courses on how to make inventions for all college students.

Initial research by faculty members and students and consideration of their projects if they reach the stage of patenting.

Providing training courses on inventions and intellectual protection for students.

Holding enlightenment meetings for all college students to motivate them towards scientific orientation.

Offering membership in the Kuwaiti Society for Supporting Inventors and Innovation to faculty members, training, and students at discounted prices.

Issuing a periodic scientific magazine detailing the inventions and innovations of students, faculty and training members.

Participation in the annual exhibition of scientific societies in the Authority to support the innovative movement and provide arbitrators in the event that the matter requires arbitration for inventions.

(Article Five: Cooperation Priorities)

The two parties shall achieve the desired cooperation in accordance with this memorandum, within the limits of their responsibilities and priorities, and within a framework Laws, regulations and regulations for both parties.

(Article Six: Duration of the Agreement)

This memorandum shall enter into force from the date of its signature for a period of one year and shall be automatically renewed unless either party announces it. The other wishes to terminate or amend the agreement, partially or completely, at least one month before its expiry or any extension thereof.

(Article Seven: Original copies of the memorandum)

Two original copies of this memorandum were made for each party to work on.

First party:	*Second party:*
Public Authority for Applied Education and Training	*Kuwait Society for Supporting Inventors and Innovation*

Appendix K

KNPC Memorandum of Understanding with CTS

شركة البترول الوطنية الكويتية
إحدى شركات مؤسسة البترول الكويتية
A Subsidiary of Kuwait Petroleum Corporation
KNPC

الهيئة العامة للتعليم التطبيقي والتدريب

ملحق مذكرة تفاهم

إنه في يوم الخميس الموافق ٣ يونيو ٢٠١٠، فيما بين كل من:

١- الهيئة العامة للتعليم التطبيقي والتدريب

ويمثلها في التوقيع على هذه المذكرة مديرها العام

الأستاذ الدكتور/ يعقوب يوسف الرفاعي **(طرف أول)**

٢- شركة البترول الوطنية الكويتية

ويمثلها في التوقيع على هذه المذكرة رئيس مجلس الإدارة والعضو المنتدب

السيد/ فاروق حسين الزنكي **(طرف ثاني)**

تمهيد

لما كان الطرف الأول قد اعتمد تخصص تكنولوجيا الصناعات الكيميائية بكلية الدراسات التكنولوجية ورغبة من الطرف الثاني بالاستفادة من الطلبة الخريجين بالقسم المذكور لأغراض تشغيل المصافي المملوكة لها وفقا لاحتياجاتها فقد تم الاتفاق بين الطرفين على ملحق مذكرة التفاهم المذكورة وفقا لما يلي:

مادة -١-

يعتبر التمهيد السابق جزءا لا يتجزأ من هذه المذكرة والتي تعتبر ملحقا لمذكرة التفاهم المعتمدة بتاريخ ٨ مارس ٢٠٠٤ والخاصة بتخصص تكنولوجيا تشغيل المصافي بين الهيئة والشركة.

مادة -٢-

تكون الكلمات المبينة أدناه التعاريف المبينة قرين كل منها:

أ – الهيئـة: ويقصد بها الهيئة العامة للتعليم التطبيقي والتدريب

ب- الكليـة: ويقصد بها كلية الدراسات التكنولوجية

ج - القسم: ويقصد به قسم تكنولوجيا الهندسة الكيميائية بكلية الدراسات التكنولوجية التابعة للهيئة العامة للتعليم التطبيقي والتدريب

د- الشركة: شركة البترول الوطنية الكويتية

و- التخصص: ويقصد به تخصص تكنولوجيا الصناعات الكيميائية

مادة -٣-

تقوم الهيئة بتنفيذ البرنامج الدراسي في تخصص تكنولوجيا الصناعات الكيميائية من خلال الخطة الدراسية المعتمدة مع عدم تحمل شركة البترول الوطنية الكويتية أية مصاريف مالية.

مادة -٤-

تساهم الشركة بتنفيذ التدريب الميداني للطلبة في مصافي الشركة بموجب التعاون والتنسيق بين الطرفين، على أن يقوم الطرف الأول بتزويد الطرف الثاني بأعداد المتدربين مسبقا حيث سيتم تحديد أعداد المتدربين وفقا لإمكانيات الطرف الثاني ولا يستحق الطالب مكافأة طوال فترة التدريب.

مادة -٥-

تقوم الهيئة بتخريج الطلبة سنويا في تخصص تكنولوجيا الصناعات الكيميائية وذلك طبقا للخطة المعتمدة من الهيئة، على أن تقوم الشركة بتعيين الخريجين من تخصص تكنولوجيا الصناعات الكيميائية وفقا لاحتياجاتها متى اجتاز الخريج الكويتي إجراءات الفحص الطبي والمقابلات الشخصية.

مادة -٦-

تختص الشركة بإجراء الفحص الطبي والمقابلات الشخصية لمن يتقدم لها من الطلبة الخريجين الكويتيين في التخصص قبل تعيينهم بالشركة.

الطرف الأول	الطرف الثاني
الهيئة العامة للتعليم التطبيقي والتدريب	**شركة البترول الوطنية الكويتية**
المدير العام	**رئيس مجلس الإدارة والعضو المنتدب**
PAAET	**KNPC**

Appendix L

KNPC Sample Contract with CTS Students

شركة البترول الوطنية الكويتية
إحدى شركات مؤسسة البترول الكويتية
A Subsidiary of Kuwait Petroleum Corporation KNPC

اتفاق لمنح مكافأة تشجيعية لطلبة كلية الدراسات التكنولوجية
تخصص "تكنولوجيا تشغيل المصافي"

إنه في الموافق / / فيما بين كل من:

أ) شركة البترول الوطنية الكويتية (ش.م.ك) وعنوانها مدينة الأحمدي المكتب الرئيسي (دار الوطنية) ويمثلها في التوقيع على هذا الاتفاق مدير دائرة التدريب والتطوير الوظيفي، والمسماة فيما بعد بالشركة (طرف أول).

ب) طالب بكلية الدراسات التكنولوجية (تخصص تكنولوجيا تشغيل المصافي) والمسمى فيما بعد (طرف ثاني).

تمهيد:

لما كان الطرف الثاني طالباً بكلية الدراسات التكنولوجية تخصص "تكنولوجيا تشغيل المصافي" ورغبة من الطرف الأول بمنح الطالب مكافأة تشجيعية أثناء دراسته بالكلية حسب الشروط المرفقة في هذا الاتفاق واستناداً إلى موافقة الهيئة العامة للتعليم التطبيقي والتدريب فقد تم الاتفاق بين الطرفين على الآتي:

أولاً: يعتبر التمهيد السابق جزء لا يتجزأ من هذا الاتفاق.

ثانياً: لشركة البترول الوطنية الكويتية إجراء لقاء تنويري للطلبة لشرح بنود الاتفاق قبل التوقيع عليها.

شركة البترول الوطنية الكويتية
إحدى شركات مؤسسة البترول الكويتية
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ثالثاً: يتعهد الطالب قبل التوقيع على هذا الاتفاق بأن يلتزم بالآتي:

١. تقديم المستندات الرسمية المطلوبة.
٢. اجتياز الفحوصات الطبية.
٣. تقديم (لا حكم عليه) من الأدلة الجنائية بوزارة الداخلية.
٤. اجتياز اختبار اللغة الإنجليزية بنسبة (٣٠) درجة أي ما يعادل لمستوى (Elementary).
٥. اجتياز المقابلة الشخصية.
٦. اجتيازه للمقررات المطلوبة في الفصل الدراسي بمعدل (٢,٥) للعام والتخصص التراكمي.

رابعاً: لا يعد هذا الاتفاق عقد تدريب، ولا تلتزم الشركة بتعيين من يوقع هذا الاتفاق فور انتهاء اكتمال دراسته ولا يعد هذا الاتفاق وعداً بالتعاقد أو ملزم للشركة، وللشركة تعيين الطالب في حالة توافر الشروط الآتية:

١. احتياج الشركة للتخصص.
٢. اجتياز الطالب المقررات المطلوبة للتخصص بنجاح وبتقدير (٢,٥) على الأقل وبمدة لا تزيد عن سنتين ونصف السنة تنتهي خلالها الوحدات الدراسية المقررة للتخصص.
٣. اجتياز الطالب المتدرب فترة التدريب العملي المقررة في مصافي الشركة بنجاح.
٤. اجتياز الطالب الفحوصات الطبية والمقابلة الشخصية المقررة للوظيفة بعد التخرج من الكلية وتقديم (لا حكم عليه) من الأدلة الجنائية بوزارة الداخلية.
٥. أن يكون الطالب حسن السير والسلوك خلال فترة دراسته في التخصص المطلوب بموجب شهادة صادرة من الكلية تفيد ذلك.
٦. اجتياز الطالب المقابلة الشخصية بنجاح.

خامساً: تسري على الطالب جميع لوائح وأنظمة كلية الدراسات التكنولوجية في الهيئة العامة للتعليم التطبيقي والتدريب أثناء الدراسة.

سادساً: تتعهد الشركة بمنح الطالب مكافأة شهرية وقدرها ٣٠٠ دينار كويتي تصرف بعد نهاية كل فصل دراسي من الفصل الدراسي الذي وقع فيه الطالب هذا الاتفاق، حتى نهاية الفصل الخامس من دخول التخصص إذا التزم الطالب بتعهداته اتجاه الشركة.

- تصرف مكافأة الفصل الصيفي للطلبة المسجلين في الفصل الصيفي فقط.

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- يتم إيقاف صرف المكافأة في حال انخفاض معدل الطالب العام/التخصص عن (٢,٥).

سابعاً: يجب على الطالب أن يتعهد بالالتزام بالآتي:

١. التقدم بطلب التعيين في الشركة خلال مدة شهر بحد أقصى من تاريخ التخرج.
٢. الالتزام بتسليم صحيفة الأدلة الجنائية واجتياز الفحوصات الطبية والمقابلات الشخصية.
٣. ابلاغ الشركة بعدم الرغبة في الالتحاق بالعمل لديها خلال مدة شهر بحد أقصى من تاريخ التخرج. مع التزامه برد مبلغ ٢٥٪ من اجمالي المكافآت التي صرفت له.

ثامناً: يعتبر هذا الاتفاق لاغياً في الحالات الآتية:

١. إذا تم فصل الطالب من التخصص (تكنولوجيا تشغيل المصافي) أو الكلية لأي سبب كان.
٢. إذا غير الطالب تخصصه (تكنولوجيا تشغيل المصافي) إلى أي تخصص آخر.
٣. عند تجاوز مدة سنتان ونصف السنة في التخصص (خمس فصول دراسية، ولا يحسب الفصل الصيفي ضمن الفصول الدراسية الخمس).

- وفي جميع الأحوال لا يكون للطالب المتدرب الحق في الرجوع على الشركة أو مطالبتها بأي مبالغ أو حقوق متعلقة بهذا الاتفاق.

تاسعاً: يحق للشركة استرداد ٢٥٪ من إجمالي المكافآت التي صرفت للخريج أثناء دراسته في الحالات التالية:

١. عدم التحاق الطرف الثاني بالعمل في الشركة بعد تخرجه لأي سبب كان.
٢. إنهاء الطرف الثاني عمله بالشركة لأي سبب كان قبل مرور سنتين متصلتين من تاريخ التعيين بوظيفة مشغل حقل.

حرر هذا العقد من نسختين لكل طرف نسخة منه بعد توقيعها للعمل بموجبها.

الطرف الأول	**الطرف الثاني**
عن/ شركة البترول الوطنية الكويتية	**الطالب/**
التاريخ:	**التاريخ:**
س ع/ام/ز د	

Appendix M

CTS ABET Accreditations for Chemical Engineering Program

Appendix N

CTS Approval to Conduct the Case Study and Provide the Required Data

بسم الله الرحمن الرحيم

2020/01/23

الدكتور / عبدالله المزروعي المحترم

عميد كلية الدراسات التكنولوجية

السلام عليكم ورحمة الله وبركاته وبعد ،

الموضوع : إحصائيات خاصة بخريجي كلية الدراسات التكنولوجية بغرض البحث ألاكاديمي

بالإشارة إلى الموضوع آنف الذكر ، أود إفادتكم بأنني في مرحلة كتابة رسالة الدكتوراه بالتعليم والقيادة من جامعة الباسيفيك University of the Pacific وموضوعها:

Competency Based Education and Learning : Kuwait College for Technological Studies Case Study

وان تلك الرسالة تتطلب بعض الإحصائيات الخاصة بخريجي الكلية المذكورة من عام 2012 الى عام 2018

من حيث:

- أعداد وتخصصات خريجي الكلية (أناث / ذكور)
- سنة وفصل التخرج
- تأريخ التحاقهم بسوق العمل (أن وجدت)
- حصول الكلية على اعتماد ABET لمختلف التخصصات
- تجارب الكلية بالتعاون مع سوق الكويتي العمل مثل (القطاع النفطي)
- التعليم والتدريب الميداني بمختلف قطاعات ووزارات الدولة

وليقيننا بأنكم حريصون على تشجيع البحث العلمي خاصة في مجال التعليم فإنني أرجو منكم التكرم بالموافقة على تزويدي بتلك الإحصائيات التي لا تتضمن أسماء أو تأريخ ميلاد أو أرقام مدنية للخريجين المشمولين بالدراسة.

ولكم جزيل الشكر ،،،

د. محمد عبد المحسن الشايجي

باحث علمي بجامعة الباسيفيك ـ ستوكتون كاليفورنيا ـ الولايات المتحدة