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The Development of Life and Career Skills in 21st Century Test for Undergraduate Students

Nuanphan Chaiyama*
Thailand National Sports University, THAILAND

Nimnoul Kaewpila
Thailand National Sports University, THAILAND

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Abstract: The purposes of this study were to explore factors and indicators of life and career skills and to develop a life and career skills in the 21st century test for undergraduate students. This research employed a mixed-method study adopting an exploratory design: instrument development model to generate research tools. This study was divided into two phases; Phase 1 was to explore factors and indicators of life and career skills in 21st century, by using a qualitative method to analyze relevant documents; Phase 2 was the development of a life and career skills in 21st century test by adopting a quantitative method to collect data from students studying in 12 universities of the north-eastern region of Thailand via the test. In the second phase, the data were analyzed by descriptive statistics and Confirmatory Factor Analysis (CFA) Results revealed that the skills consisted of 6 factors and 35 indicators, and the test comprised 105 items. The quality of the test has been examined by five expertise, the reliability of all test items is acceptable, and all 6 factors demonstrated good construct validity. Factor loadings of six factors were 0.7940 -1.7816. This study can be implemented to measure the life and career skills of undergraduate students in any university to obtain data for establishing a policy and plans for maximizing students' potential to achieve their careers and a happy living in 21st century after their graduation.

Keywords: *Life and career skills indicator, life and career skills test, skills in 21st century.*

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Introduction

In 21st century, global society has been changing into the world of creative economy that emphasizes life skills and value-added innovative products. According to Office of the Basic Education Commission (OBEC), the competitiveness of information technology is also one of the changes that affect people's lifestyles and makes careers more complex (OBEC, 2012) Therefore, career and life skills in this era are essential. To develop and promote skillful people for 21st century requires a paradigm shift and system-wide development, for helping them well-prepared for the economic and social changes as well as the challenges of those changes. One factor that needs to be promoted is the quality of people (Hoskins & Liu, 2019).

Improving the quality of people for 21st century needs the transformation of teaching in terms of life and career skills at any level in educational institutions. Teaching transformation is not only for solving problems, communicating effectively in daily life, and being consistent with employers' needs (Economist Intelligence Unit Limited, 2015) but also needs a holistic process of development to makes learners skillful. Preparation of the readiness of teachers is crucial as well since it relates directly to students' quality and readiness to live in the rapidly changing world.

National Statistical Office (2021) conducted a survey on the working conditions of the Thai people in the first quarter of 2021. The unemployment rate was discovered to be 2.0%. With a rate of 3.5 percent, undergrads had the highest percentage of unemployment. The findings revealed a lack of promotion of key career skills for learners to employ in the workplace at the bachelor's degree level. The skills of new graduates do not meet the demands of the current labor market, including learning skills that do not meet the needs of the organization.

Hence, the development of learners in this century requires learners to learn through hands-on or hands-on practice so that they can build their knowledge based on what they have done. Moreover, they can be able to apply new knowledge creatively (Neary et al., 2015) and being a self-directed learner transforming from a basic skills learner to be an explorer

* **Corresponding author:**
Nuanphan Chaiyama, Thailand National Sports University Udon Thani Campus, Faculty of Education, Thailand. ✉ dr.nuanphan@gmail.com

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that expands their learning styles so that they can create their opportunities to be an expert. Taking initiative from the advanced skill level to the professional level needs a commitment to learning with lifelong-learning processes, critically reflecting past experiences to provide information for future development (Battelle for Kids, 2019).

In Thailand, tertiary education is considered the highest level of education in organizing and preparing quality people for the workforce market. Therefore, the development and modification of learners' behavior based on experiences gained during their studies at this level is essential. Office of Higher Education Commission (OHEC) has Thailand Qualification Framework for Higher Education (TQF) as the guidelines for developing students' learning outcomes that meet the needs of society, labor market, and the occupation standards the graduates are carrying out after their graduation. These frameworks comprise of 5 domains of learning, namely ethical and moral development, knowledge, cognitive skills, interpersonal skills and responsibility, and analytical and communication skills (OHEC, 2009).

To develop learners to achieve the desired characteristics and being able to go out to work and face the various situations amid the changes of 21st century, we need to know the factors and indicators that truly measure the level of life and career skills within those students. The researchers are, therefore, interested in developing a quality scale for measuring life and career skills for 21st century, with comprehensive factors and indicators that can be applied for setting goals, auditing, and as a criterion for assessing life and career skills levels of undergraduate students. The levels of life and career skills can also be taken as a guideline in planning education management in accordance with the learning progress of learners in terms of life and career skills, including being able to produce competent graduates to work effectively and to live their own lives in the 21st century with good quality and happiness.

Literature Review

A life skill is a psychological skill concerning new experiences in life. It is simply said as the emotional and social quotient of oneself that helps in learning for properly adapting behavior, analyzing and considering information for decision-making purposes, as well as for communicating with others effectively (United Nations Children's Fund [UNICEF], 2020; World Health Organization [WHO], 1999). Having life skills makes individuals know how to take care of themselves physically, emotionally, and mentally, which will result in a happy living condition and being able to live their lives without being a burden to society. It also includes preparation for future adaptation (OBEC, 2012; Tantipiwatanaskul et al., 2012). Life skills are therefore used to develop children and youth in a global society, including Thailand to help them wisely make thinking critically, adapt, decisions making, communicate emotion, and stress management (Department of Mental Health, Ministry of Public Health, 2016).

As the world is facing rapid changes in socials, cultures, politics, economics, and technology, the term "life skills" is not best suited for the changes as there is a high level of competitiveness in the workforce market. As a result, educational institutions have started to initiate student development programs to encourage students to be prepared and equipped with career skills. The term "life skills" was replaced by "life and career skills" to cover both attributes and to make students ready for their living and their profession in this century. Consequently, they can live on their own, work independently and collaboratively with others, and understand and respect the diversity of people (Knowlton, 2013; Minnesota State Colleges and Universities, 2021). Moreover, having knowledge and thinking skills are most important for living in the complexity of this era as individuals can make use of them amid the overwhelming and competitiveness of information and data (Partnership for 21st Century Skills, 2009). as well as to help them able be decisive, creative, critical, which are forming them to be active citizens and, most importantly, living their best lives (Drew, 2016; Herzing University, 2021).

WHO (1999) indicated the ten core life skills that individuals should be developed and apply to their good quality of living in sub and global societies. These core skills have been widely used as guidelines to develop a life skill program for youth and individuals both in formal and non-formal educational settings, including public and private organizations, or policymakers, etc. This proposal has been later defined more different and more elements to cover skills in the field of work needed in 21st century. International Youth Foundation (IYF) (2014), for example, has adopted and developed a 13-core skills development program for youth. The Organization for Economic Cooperation and Development (OECD) has launched the Program for International Student Assessment or PISA to measure 15-year-olds' ability to use their reading, mathematics, and science knowledge and skills to meet real-life challenges, which are including 12 skills (Economist Intelligence Unit Limited, 2015). Neary et al. (2015) presented The Leader Framework for Career which included five main areas that all citizens should attend to as they develop their careers. Those five areas were 1) personal effectiveness, 2) managing relationships, 3) finding and accessing work, 4) managing life and career, and 5) understanding the world. The first phase of the study was focusing on Leaning and Decision-Making Resource (LEADER). They administered questionnaires to workers working in career-related roles in Greece, Romania, United Kingdom, Spain, and Italy. Their results showed the format of evaluation in their countries. For example, in Greece, there is an organization named the National Organization for the Certification of Qualifications and Vocational Guidance (EOPPEP) that uses an e-Portfolio as a self-assessment tool for youth and adults to measure their career skills, consisting of 11 skills. United Nations Educational, Scientific and Cultural Organization (UNESCO, 2018), with WARD, and NGO collaboration, started an intensive life and career skills training in 2016 in form of modules. One of the modules added to the course has consisted of three core skills. UNICEF (2017) introduced The Life Skills and Citizenship Education (LSCE) Framework, which outlines 12 key life skills students should develop for better employment and success.

Also, Partnership for 21st Century Skills (P21) has developed a framework for 21st century learning by combining knowledge, specific skills, expertise, and literacy in various fields to help practitioners to integrate their skills to the contents of academic subjects, to be successful in both life and career. In life and career skills component consisted of five elements (Partnership for 21st Century Skills, 2009). West Yadkin Elementary (2020) presented the components of life and career skills with WHO's nine skills. Trembath (2020), as well, introduced that life skills can improve one's career during their free time or travel, consisting of 15 skills. In Thailand, the Office of the Basic Education Commission (OBEC) identified four components of life skills that utilize building and developing children immunity for living in this century as well as to prepared them for the future. This includes four key components (OBEC, 2012). All those factors of life and career skills mentioned earlier can be summarized as in Table 1.

Table 1. Summary of Factors of Life and Career Skills

Academic / Organization	Elements of Life and Career Skills	Academic / Organization	Elements of Life and Career Skills	Academic / Organization	Elements of Life and Career Skills
World Health Organization (1999)	1. Decision-making 2. Problem-solving 3. Creative thinking 4. Critical thinking 5. Self-awareness 6. Empathy 7. Communication 8. Interpersonal skills 9. Management of emotions 10. Management of stress	United Nations Children's Fund (2017)	1. Learning 1) Creativity 2) Critical thinking 3) Problem-solving 2. Employability 1) Cooperation 2) Negotiation 3) Decision making 3. Personal empowerment 1) Self-management 2) Resilience 3) Communication 4. Active citizenship 1) Respect for diversity 2) Empathy 3) Participation	Economist Intelligence Unit Limited (2015)	1. Literacy 2. Numeracy 3. Foreign-language skills 4. Problem-solving 5. Team working 6. Communication 7. Critical thinking 8. Creativity 9. Digital literacy 10. Leadership 11. Emotional intelligence 12. Entrepreneurship
International Youth Foundation (2014)	1. Self-confidence 2. Respecting self and others 3. Interpersonal skills: empathy, compassion 4. Managing emotions 5. Personal responsibility (including dependability, integrity, and work ethics) 6. Positive attitude and self-motivation 7. Conflict management 8. Teamwork 9. Communication-listening, verbal, and written 10. Cooperation and teamwork 11. Creative thinking 12. Critical thinking and Problem solving 13. Decision making	Neary et al. (2015)	1. Adequate knowledge and understanding of the Greek language. 2. The ability to speak other foreign languages 3. Numeracy 4. Digital literacy 5. Ability to engage in lifelong learning activities 6. Problem-solving skills 7. Creativity and flexibility 8. Communication and interpersonal skills 9. Ability to work in groups 10. Entrepreneurial skills 11. Vocational skills related to specific professions	Trembath (2020)	1. Empathy 2. Resilience 3. Cultural competence 4. Communication 5. Planning 6. Goal-setting 7. Budget management 8. Creativity 9. Language skills: not just learning a language 10. Problem-solving 11. Self-awareness and introspection 12. Curiosity 13. Adaptability 14. Analytical thinking 15. Confidence

Table 1. Continued

Academic / Organization	Elements of Life and Career Skills	Academic / Organization	Elements of Life and Career Skills	Academic / Organization	Elements of Life and Career Skills
United Nations Educational, Scientific and Cultural Organization (2018)	1. The life skills 1) Negotiation 2) listening 3) Communication 4) Self-management 5) Work ethic 6) Work 7) Environment & greening 2. Digital skills 1) The use of technology 2) Equipment and means of communication for work purposes 3) Internet 4) Search engines and searching techniques 5) Writing reports and correspondence 3. Entrepreneurial skills 1) Initial steps to establish and manage a project 2) CV (Preparing a CV) 3) laws 4) Project financing methods 5) Risk calculation 6) The organization of the workplace	Partnership for 21st Century Skills (2009)	1.Flexibility and Adaptability 1) Adapt to Change 2) Flexible 2.Initiative and Self-direction 1) Manage Goals and Time 2) Work Independently 3) Be Self-directed Learners 3.Social and Cross-cultural Skills 1) Interact Effectively with Others 2) Work Effectively in Diverse Teams 4. Productivity and Accountability 1) Manage Projects 2) Produce Results 5. Leadership and Responsibility 1) Guide and Lead Others 2) Be Responsible to Others	West Yadkin Elementary (2020)	1. Leadership 2. Ethics 3. Accountability 4. Adaptability 5. Personal Productivity 6. Personal Responsibility 7. People Skills 8. Self-Direction 9. Social Responsibility
				Office of the Basic Education Commission. (2012)	1. Awareness and value in oneself and others 2. Analytical Thinking, Decision Making, and Creative Decision Making 3. Management of emotion and stress 4. Building a good relationship with others

Methodology

This research uses a mixed methodology, qualitative and quantitative, by employing exploratory design: instrument development model (Creswell & Plano Clark, 2011)

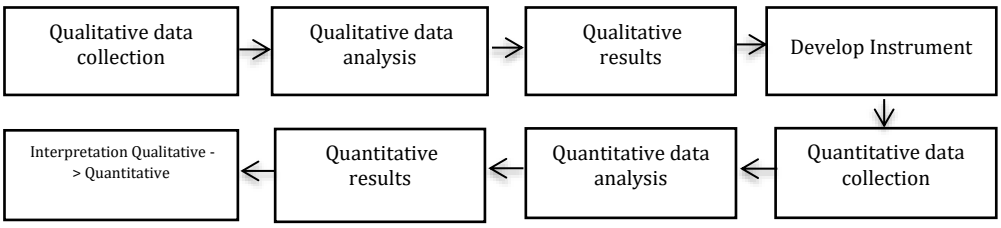

Figure 1. Exploratory design: Taxonomy development model

This study has to divides the study into two phases as follows.

Phase 1: Exploring the Factors and Indicators

This phase used a qualitative study to identify factors and indicators of life and career skills in 21st century, in 2 steps.

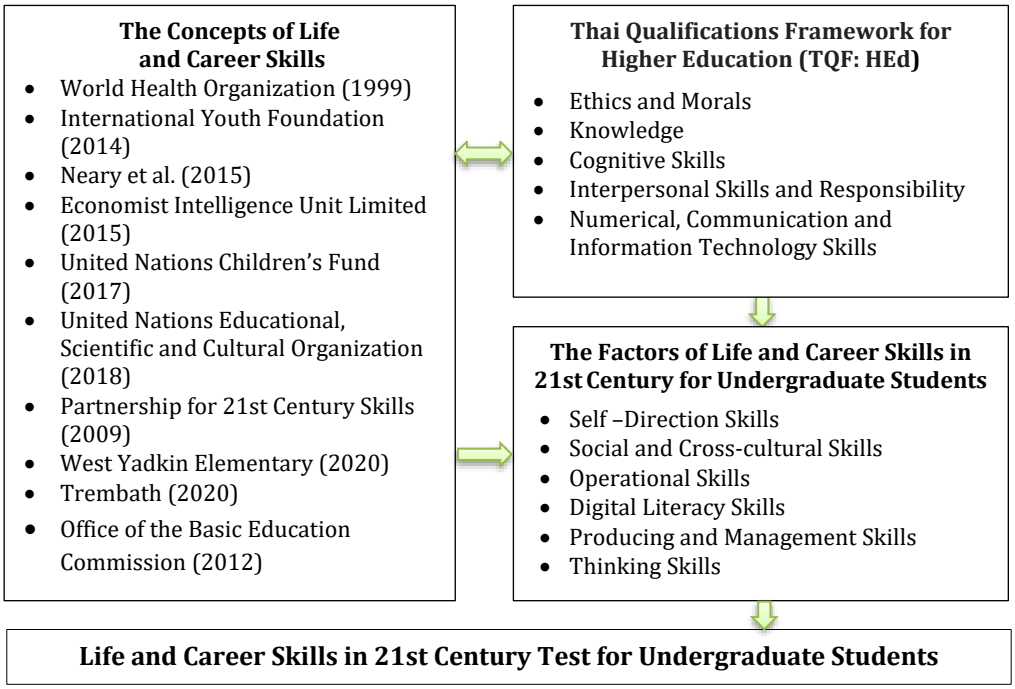

Figure 2. Research Design

Step 1: Analysis and Synthesis of the Factors and Indicators

To be consistent with the quality of graduates and according to the TQF, researchers reviewed relevant documents and research, internationally and domestically, to define and identify 21st century life and career skills factors and indicators for undergraduates to obtain information that is most truly relevant to Thai society. Ten documents were selected based on their relevance and authority.

Step 2: Confirmation of Factors and Indicators

Factors and indicators were verified in terms of content validity by five expertise. Other additional recommendations made by those experts were also considered to use for creating the test.

Research Instruments

The research instruments were the Content Validity Assessment Form that covered the content of the life and career skills in 21st century, the correctness and clarity of the language usage, and other additional recommendations.

Data Analysis

Researchers analyzed qualitative data from documents and expertise' recommendations through content analysis. Data were presented in the form of a summary synthesis of each factor and indicator. To make the factors and indicators valid in terms of content validity, indicators with an Index of item objective congruence (IOC) valued between 0.60-1.00 were selected, some of them needed to be improved according to the expertise' recommendations.

Phase 2: Developing the Life and Career Skills in 21st Century Test

In this phase, the researchers used quantitative methods to create the test in 2 steps.

Step 1: The Test Construction

In this step, researchers used the factors and indicators of life and career skills obtained from phase 1 to define their meaning. A hands-on approach to creating questions on life and career skills in 21st century test for undergraduate students. It creates questions to cover the definitions that have been defined. The scoring model is a five-level estimation based on the Likert rating scale, which is a quantitative tool. Then, the test was verified its content validity by five expertise, for the coverage of the contents, the correctness and clarity of the language used, the appropriateness of the measurement, and other additional recommendations.

According to expertise' analysis of content validity, the test items with an IOC value between 0.60-1.00, were selected, and some items were improved.

Step 2, Examination of the Goodness of Fit of the Test

The researchers used the validity and reliability data collected from the study in Phase 2, Step 1, to revise the test questions before applying to the undergraduate students across north-eastern region universities for CFA. Participants of this stage were students in the second semester, academic year 2020.

Participants

The participants of this study were determined by two-stage random sampling; firstly, randomizing the universities into three categories- public, semi- private and private; there was a total of 12 universities, 4 universities each; secondly, allocating the numbers of students from those universities, who were undergraduate students studying in the second semester of academic year 2020. Bentler and Chou (1987) stated that CFA required at least 5-20 samples per one parameter. Gagne and Hancock (2006) also suggested that there should be at least 400 samples for CFA. Therefore, researchers assigned 500 samples in this sense. The sample group were a group of undergraduate students studying in the second semester of the academic year 2020.

However, to assure the external validity of the study, the researchers collected data with a larger number of samples than the initially predetermined. Completed the test were obtained from 514 samples and used for analysis purposes.

Research Instruments

The research instruments for this phase were the 21st Century Life and Career Skills Test which was passed the quality examination in the first step of this phase.

Data Collection

Data collection was conducted at the end of the second semester, academic year 2020. The researcher collected the data by their own. Before collecting the data, it is important to clarify significance, purposes and benefits of the test prior to the test administration, and had the respondents consent to participate the study.

Data Analysis

The data was analyzed in two steps.

The first step was to describe the categorical and continuous variables. In this data analysis, there was a sample of 514 people. Therefore, to check the prerequisites for CFA on the use of statistics about the nature of the parsing of the data whether the curve is normal or not, the Kolmogorov-Smirnov test was used (Bai & Ng, 2005; Yap & Sim, 2011). There was a sample group in this data analysis that was deemed to be statistically non-significant. This means the data has a normal distribution and can be analyzed with CFA assertive element analysis (Table 2). When the data were not normally distributed, statistical analysis was performed on the logarithmic transformation of the data.

The second step was an analysis to examine the quality of indicators and the quality of the test, using CFA through LISREL.

Results

The Data Distributed

The Kolmogorov-Smirnov Test showed that all the variables were normally distributed.

Table 2. The Data Distributed by Kolmogorov-Smirnov Test

Test	Kolmogorov-Smirnov[a]		
	Statistic	df	Sig.
Data	.039	514	.066

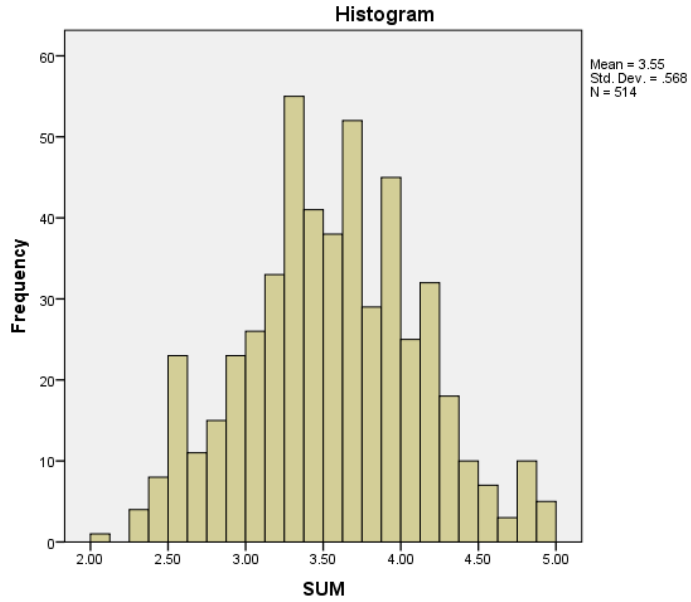

Figure 3. The Data Distributed by Using Histogram and Kolmogorov- Smirnov Test

Factors and Indicators of Life and Career skills

According to the findings, the skills in 21st century for undergraduate students consist of 6 factors and 35 indicators as follows.

Figure 4. Life and Career Skills in 21st Century Conceptual Framework

Factor 1: Self-Direction Skills

Self-direction skills refer to the ability to control one's behavior or emotions with consciousness and intention to lead oneself to the needs of the desirable standard, consists of 6 indicators: (International Youth Foundation, 2014; OBEC, 2012; Partnership for 21st Century Skills, 2009; Trembath, 2020; UNESCO, 2018; West Yadkin Elementary, 2020; WHO, 1999).

- *Self-Awareness* - the ability to know and understand oneself including aptitudes, capabilities, strengths, and weaknesses, and self-esteem.
- *Curiosity and Self-Directed Learning* - the ability to express determination and perseverance of learning, according to self-interests and needs, including knowing how to pursue learning resources as well as how to assess the progress of self-learning.
- *Confidence* – the ability to show confidence in one's potential, capabilities, and decision making, be assertive in performing tasks, choosing ways to accomplish tasks, or solving problems effectively as well as showing determination to succeed.
- *Flexible and Resilience* - the ability to adjust behaviors, thoughts or attitudes appropriately to instantly changing situations, contexts, and environment.
- *Management of Emotions and Stress* - the ability to understand and be aware of the emotional state of oneself and others; knowing how to control emotions and stress, and how to relax and avoid them; knowing how to find ways to adjust behaviors that cause unwanted emotions to be in a good way.
- *Goal-Setting & Time Management* - the ability to set goals or intentions in what you want, control, and implement effective actions to achieve results according to the defined time and objectives.

Factor 2: Social and Cross-Cultural Skills

Social and cross-cultural skills refer to the ability to understand, perceive, and respect other's perspectives, emotions, and feelings, as well as to build relationships and cooperation with others. This factor consists of 6 indicators: (WHO, 1999; International Youth Foundation, 2014; Neary et al., 2015; Economist Intelligence Unit Limited, 2015; UNICEF, 2017; UNESCO, 2018; Trembath, 2020).

- *Listening* - the ability to show deep listening to the speaker or the interlocutor to understand the content as much as possible without prejudice and judgments; this includes paying attention to emotions, feelings, needs, values, and beliefs of the speaker or the interlocutor.
- *Communication* - the ability to interact and to share information with others with understanding objectives of the communication and presentation of information clearly and accurately including understanding how to use proper speech and body language to attract others' intention.
- *Interpersonal Skills* - the ability to build good relationships between people to achieve love, understanding, respect, cooperation, and living happily with other people in society.
- *Respect for Diversity* - the ability to understand and accept the similarities or differences between individuals in various aspects: culture, race, ethnicity, gender, age, social class, sexual orientation, and ability/disability, and behave towards them in a way that would not offend.
- *Empathy* - the ability to perceive and understand, and share someone else's feelings, emotions, needs, thoughts, desires, and preferences, as well as the willingness to help those inferior or those who have suffered.
- *Responsibility* - the ability to fully express self-determination on the job, duty, and society to achieve the goal, as well as to accept the results of own actions and try to improve them to get the job done.

Factor 3: Operational Skills

Operational skills refer to the ability to do tasks on one's own, focusing on practicing and developing the skills necessary to work regularly both solo and group work. This includes an ethical and responsible manner to accomplish the goals. This factor consists of 6 indicators: (Economist Intelligence Unit Limited, 2015; International Youth Foundation, 2014; Neary et al., 2015; Trembath, 2020; Partnership for 21st Century Skills, 2009; UNESCO, 2018; UNICEF, 2017; West Yadkin Elementary, 2020).

- *Work Independently* - the ability to perform work without any assistance or direct supervision, with full knowledge and ability to accomplish the scope and schedule of work effectively according to the quality and standard of the work.
- *Cooperation and Teamwork* - the ability to work together as a group with the same goal, interact between group members, divide duties and responsibilities, and satisfy their duties to effectively achieve the same goal.
- *Negotiation and Conflict Management* - the ability to discuss and exchange with someone to reach an agreement and try to reach a common ground as well as to promote cooperation at a higher level.
- *Leadership* - the ability to use interpersonal relationships to influence or direct others to accomplish the job effectively and efficiently, as well as the ability to push the organization to be successful and to achieve its goals.
- *Foreign Language Skills* - the ability to use language correctly, suitable for society, culture, situations, and work, especially English language which is defined as one of the foremost world languages.
- *Work Ethic* - the ability to comply with the rules and regulations of work appropriately for the peace of self and society.

Factor 4: Digital Literacy Skills

Digital literacy skills refer to the ability to apply digital technology media and devices to store and process information in various forms, to use the internet for searching and communication, as well as to use applications for work effectively and efficiently. This skill consists of 6 indicators as follows (Economist Intelligence Unit Limited, 2015; UNESCO, 2018).

- *Numeracy* - the ability to apply the basic calculation, statistics, and be able to interpret statistic information as well as to present information in various formats.
- *Technology* - the ability to use tools, equipment, or technology involved in the operation effectively, as well as to select and apply modern technology to develop and improve work efficiency.
- *Tool and Means of Communication* - the ability to choose media and various communication tools right to the objectives of communication, effectively.
- *Internet* - the ability to confidently access and use the features of the internet for learning and performance.
- *Search Engines and Search Techniques* - the ability to use tools for searching information online, as well as to select suitable searching methods and techniques to save data in different ways, efficiently.
- *Writing Reports and Correspondence* - the ability to use computer applications to produce reports effectively, to draft, type, and print correspondence with accuracy, clarity, and purpose as well as to send and receive emails confidently.

Factor 5: Producing and Management Skills

Producing and management skills refer to the ability to initiate and create new things, along with planning and management, the ability to see opportunities, and to accept potential risks for taking the most valuable results. Ethics awareness, legal knowledge, and social and environmental responsibility are also included. This factor consists of six indicators: (UNESCO, 2018; Partnership for 21st Century Skills, 2009; Trembath, 2020).

- *Planning and Create a Project* - the ability to think about and decide what are you going to do or how are you going to do in the future, systematically. Determining activities and resources skills are also vital for achieving the most cost-effective products or services.
- *Project Management* - the ability to apply knowledge, skills, techniques, methods, and resources for achieving the goals of activities or projects in time.
- *Risk Management* - the ability to manage the uncertainty that may affect the work processes, reducing the risk possibility to the lowest or acceptable level.
- *Law Literacy* - the ability to recognize, understand and comply with the law that is relevant to everyday life and work, including copyright and related ethical issues.
- *Organizing the Workplace* - the ability to make the workplace clean and untidy, to maintain equipment for a life-long operation, to ordinarily improve working systems of the workplace, ordinarily.
- *Environment and Greening* - the ability to get the most out of natural resources and environment, considering the lasting-long period of use and the least destroying to the environment.

Factor 6: Thinking Skills

Thinking skills refer to the ability to think in various dimensions that necessary for living, learning, and working; and be able to make decisions and solve problems creatively, as well as to live a normal with happiness and quality life. This factor consists of 5 indicators as follows (WHO, 1999; International Youth Foundation, 2014; Neary et al., 2015; Economist Intelligence Unit Limited, 2015; UNICEF, 2017; Trembath, 2020; OBEC, 2012).

- *Critical Thinking* - the ability to think, analyze, synthesize and evaluate contents or events that are problematic or conflicting by applying knowledge and experience to practice appropriately and reasonably.
- *Analytical Thinking* - the ability to classify and distinguish information or problems into smaller elements in various facets, including identifying the relationships between those elements and then, analyzed them to find the real cause of what happened systematically.
- *Creative Thinking* - the ability to see the relationships of things, and to expand the boundary of the idea to new, broader, and diverse horizons for finding the best answer to the problem as well as to create new things that differ from the original both in quality and quantity.
- *Problem-Solving* - the ability to think systematically to identify the causes of problems or difficulties and to seek alternative ways to solve those problems.
- *Decision-Making* - the ability to choose the best option from various alternatives to implement effective solutions or to get the most benefit with least or without mistakes.

The Test Development

Based on the results of the first phase, the test has 105 questions of six factors. The first five factors contain 18 items each, and the last factor contains 15 items.

Content Validity

Content validity of the test was determined through its item-objective congruence (IOC) by five expertise. The IOC results of all items are between 0.60-1.00, consistent with the definition and the contents of life and career skills.

Reliability

The reliability of the test was examined from 514 undergraduate students studying in the Northeastern region of Thailand. Cronbach's alpha coefficients were used to confirm the test reliability. The results showed that every factor and indicator had an acceptable level of reliability, including .880 for self-directed and self-directed skills, .948 for social and cross-cultural skills, .949 for operational skills, .883 for digital literacy skills, .939 for production and management skills, and .993 for thinking skills and the reliability of the test .989.

Construct Validity

Construct validity of the test was verified by analyzing for coefficient correlations among the variables of those six factors and the coefficient turned out to be 0.35-1.00 in each factor. This means that all the variables are statistically correlated (*p=.01*).

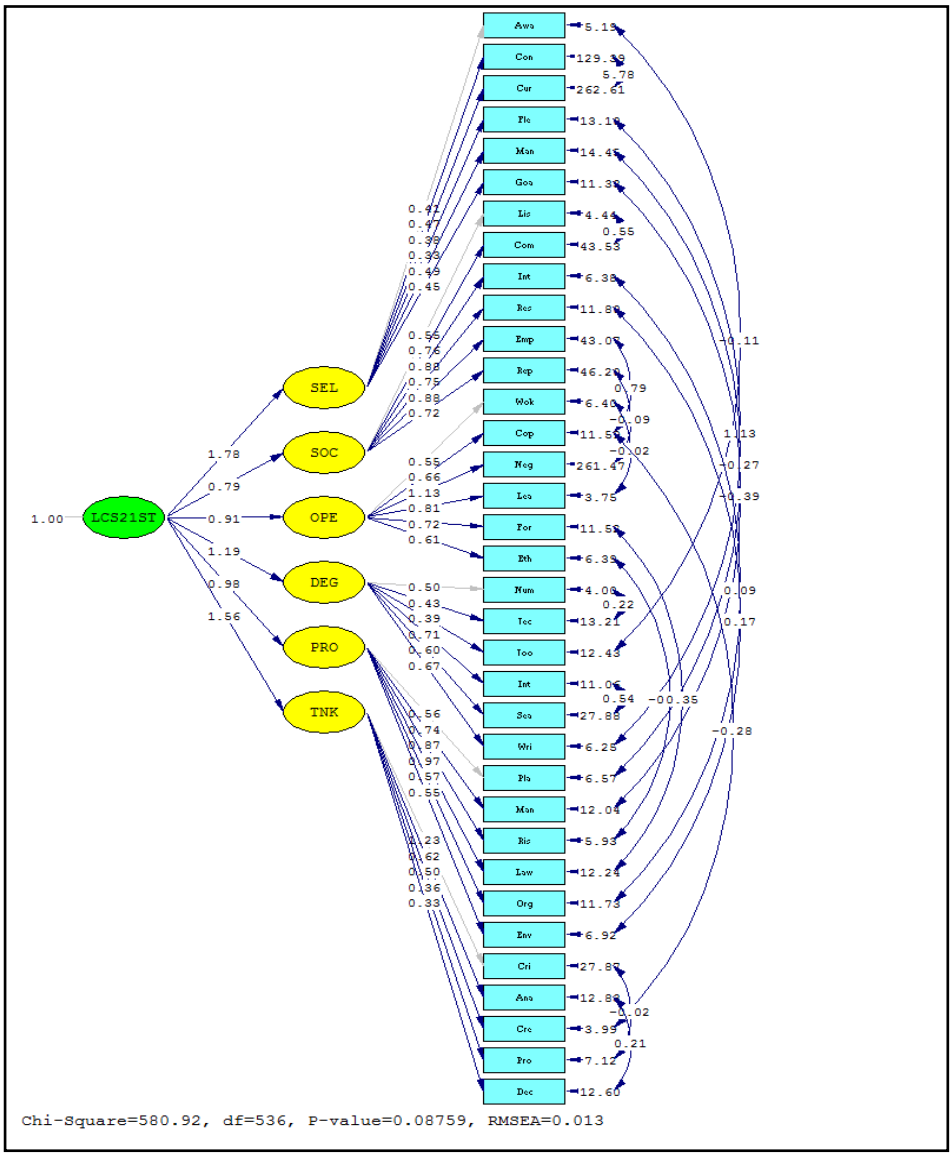

Figure 5. The Measurement model of Life and Career Skills in 21st Century Test for Undergraduate Students

Table 3. Estimation of Statistical Parameters in the Measurement Model of Life and Career Skills in the 21st Century Test for Undergraduate Students

Variable	Factor Loadings					
	SE	t	SS	SC	FS	R^2
Self-Direction Skills						
Self-awareness	-	-	0.4113	0.1776	-0.0852	0.0315
Curiosity and self-directed learning	0.3578	1.3184	0.4717	0.0414	-0.0039	0.0017
Confidence	0.5003	0.7520	0.3763	0.0232	-0.0015	0.0005
Flexible and resilience	0.1266	2.5781	0.3263	0.0898	-0.0362	0.0081
Management of emotions and stress	0.1453	3.3820	0.4915	0.1282	-0.0358	0.0164
Goal-setting & time management	0.1303	3.4591	0.4506	0.1327	-0.0417	0.0176
Social and Cross-cultural Skills						
Listening	-	-	0.5500	0.2525	0.0620	0.0638
Communication	0.4582	1.6666	0.7636	0.115	0.0081	0.0132
Interpersonal skills	0.2819	3.1286	0.8819	0.3296	0.0702	0.1086
Respect for diversity	0.2934	2.5726	0.7548	0.2146	0.0323	0.0461
Empathy	0.4733	1.8502	0.8757	0.1323	0.0101	0.0175
Responsibility	0.4676	1.5340	0.7173	0.1049	0.0079	0.0110
Operational Skills						
Work Independently	-	-	0.5484	0.2119	0.0349	0.0449
Cooperation and teamwork	0.2728	2.4248	0.6615	0.1907	0.0247	0.0364
Negotiation and conflict management	0.9787	1.1581	1.1334	0.0699	0.0018	0.0049
Leadership	0.2483	3.2420	0.8051	0.3837	0.0869	0.1473
Foreign language skills	0.2800	2.5545	0.7154	0.2063	0.0245	0.0425
Work ethic	0.2247	2.7057	0.6081	0.2339	0.0389	0.0547
Digital Literacy Skills						
Numeracy	-	-	0.5014	0.2433	0.0144	0.0592
Technology	0.1866	2.3019	0.4295	0.1174	0.0035	0.0138
Tool and means of communication	0.1836	2.1308	0.3911	0.1102	0.0043	0.0122
Internet	0.2051	3.4548	0.7085	0.2083	0.0073	0.0434
Search engines and search techniques	0.2726	2.2116	0.6028	0.1134	0.0024	0.0129
Writing reports and correspondence	0.1718	3.8771	0.6659	0.2574	0.0083	0.0662
Producing and Management Skills						
Planning and create a project	-	-	0.5610	0.2139	0.0313	0.0457
Project management	0.2704	2.7278	0.7377	0.208	0.0227	0.0432
Risk management	0.2625	3.324	0.8724	0.3372	0.0525	0.1137
Law literacy	0.3156	3.0686	0.9686	0.2668	0.0276	0.0712
Organizing the workplace	0.2398	2.3785	0.5703	0.1642	0.0170	0.0270
Environment and Greening	0.2026	2.7103	0.5492	0.2043	0.0278	0.0418
Thinking Skills						
Critical thinking	-	-	1.2305	0.227	-0.0203	0.0515
Analytical thinking	0.1637	3.7602	0.6156	0.1694	-0.0218	0.0287
Creative thinking	0.1088	4.6383	0.5047	0.2449	-0.0557	0.0600
Problem-solving	0.1134	3.1767	0.3602	0.1337	-0.0232	0.0179
Decision-making	0.1403	2.3579	0.3309	0.092	-0.0117	0.0086
Second-order Factors analysis						
Factors of Life and Career Skills in 21st century						
Self-Direction Skills	0.3044	5.8527	1.7816	1.7816		3.1740
Social and Cross-Cultural Skills	0.2078	3.8208	0.7940	0.7940		0.6304
Operational Skills	0.2541	3.5950	0.9135	0.9135		0.8344
Digital Literacy Skills	0.2243	5.2956	1.1880	1.1880		1.4114
Producing and Management Skills	0.2538	3.8447	0.9757	0.9757		0.9521
Thinking Skills	0.2452	6.3647	1.5606	1.5606		2.4353
x^2= 580.9240; df=536; p=0.08759; RMSEA=0.01278; RMR=0.03899; GFI=0.9392; AGFI=0.9286						
Model AIC= 768.9240, Saturated AIC= 1260.00, Model CAIC= 1261.6930, Saturated CAIC= 4562.6007						

The test of harmoniousness of the measurement model and the empirical data showed that the model is a good fit with the empirical data, as x^2 = 580.9240, df = 536, p = 0.08759, RMSEA = 0.01278, RMR = 0.03899, GFI = 0.9392, and AGFI = 0.9286. The results of the first confirmatory factor analysis of the measurement model of all 35 indicators revealed that the factor loadings are 0.3263 –1.2305, indicating the measurement model construct is valid, as the loadings were between 0.0005-0.1473. The result of second-order confirmatory factor analysis also confirmed the good fit to the empirical data, with the factor loadings of 0.7940-1.7816. The loadings of each factor sorting in descending order as; self-direction skills 1.7816, thinking skills 1.5606, digital literacy skills 1.1880, producing and management skills 0.9757, operational skills 0.9135, and social and cross-cultural skills 0.7940, respectively.

According to the first and second-order analysis, all six factors of the life and career skills in 21st century for undergraduate students are well fit with the empirical data and, therefore, it has construct validity.

Discussion

Factors and Indicators of Life and Career skills

Life and career skills in 21st century for undergraduate students consist of six factors— namely, self-direction skills, social and cross-cultural skills, operational skills, digital literacy skills, producing and management skills, and thinking skills. These factors are Self-direction skills that help one truly know and understand themselves as they can use these skills to manage and control their behavior and emotion. Being skillful in this factor can, also, make them perceive lead to social and cross-cultural skills that enable them to perceive and comprehend other's perspectives, build a good relationship. Not only working nor living happily with others are essential for social and cross-cultural skills, but operational skills are also helpful in working alone or with others, as these skills require a wide range of skills including ethics, responsibility, leadership, and foreign language skills to negotiate and manage conflicts. In addition, digital literacy skills benefit from applying digital technology media and devices for communication, information retrieval, work, and even invention. To do this, production and management skills are required for planning and management, seeing opportunities, and accepting potential risks that are likely to happen in the future to achieve the goals with the inclusive of ethical and law literacy along with social and environmental responsibility. All the skills mentioned above require thinking skills, especially critical and analytical thinking as part of the higher-order thinking skill which is helpful for job comprehension, building a positive attitude towards the job, and being ethical and responsible, being creative for making new inventions, and being critical for effective decision-making and problem-solving.

In 21st century, life and career skills are essential that all students need to be prepared before entering a workforce market or working with others. According to the complexity of the real work situations, being able to think analytically, creatively, and critically can bring out the best and effective decision-making or problem-solving that makes their work, as well as their living, succeed. All six factors of the test are also consistent with the National Qualification Frameworks for Higher Education in Thailand (TQF) launched by the Office of Higher Education Commission (OHEC, 2009). In addition, this study is also consistent with many scholars and organizations related to life and careers, i.e. (WHO, 1999; International Youth Foundation, 2014; Neary et al., 2015; Economist Intelligence Unit Limited, 2015; UNICEF, 2017; UNESCO, 2018; Partnership for 21st Century Skills, 2009; West Yadkin Elementary, 2020; Trembath, 2020; OBEC, 2012). The development of life and career skills for the 21st century test is also in accordance with the study of Mofrad et al. (2013). This study was to develop a scale for measuring students' life skills aged 18-25 years old, in four areas: 1) communication, 2) decision-making, 3) health care, 4) and identity development. Jegannathan et al. (2014) also investigated the effects of school-based life skills enhancement for adolescent students in Cambodia using The Life Skills Scale in four components as 1) interpersonal skills, 2) interpersonal and problem-solving skills, 3) decision-making skills, and 4) maintaining one's health and identity, and goal-setting skills. Furthermore, it is also consistent with the research of Tianroek et al. (2015) that developed a model for measuring life and occupational skills of upper secondary school students in the 21st century consisting of four components: 1) communication, 2) building relationships between people, 3) problem solving, and 4) management.

The Test Development

The life and career in 21st century test is a 5 point Likert Scale consisting of 105 items of the key traits or behavior needed to be measured. The quality of the test has been examined by five experts, based on the scale development theory, both qualitative and quantitative approaches (Lawthong, 2018; Pasiphol, 2016; Tangdhanakanond, 2014; Taweerat, 2000; Wongwanich, 2003). All questions were evaluated its content validity by five expertise for IOC values, resulted in 0.60-100. Construct validity is a good fit for the empirical data (x^2 = 580.9240, df = 536, p = 0.08759, & confirmatory factor analysis both first and second-order demonstrated the factor loadings of all six factors were lying between 0.7940 -1.7816 which were reliable and applicable for creating the test. The procedures of developing the test relied on the relevant and acceptable theories of sampling methodology Bentler and Chou (1987) and factor analysis Gagne and Hancock (2006).

Descriptive statistics were used to describe the basic features of the samples, and to describe the distribution of the variables-*namely,* frequency, distribution, percentage, max-min values, coefficient of variance, skewness, and kurtosis. To examine the quality of the factors and indicators, CFA was used in terms of content validity and the goodness of fit of the test. In addition, CFA is also used to examine the structure of variables and describe the relationship between them in terms of the smallest number of the latent variables which are the factors to be measured (Daniel, 1989; Joreskog & Sorbom, 1989) for finding the factors relevant to this study.

Conclusion

This study yielded two main findings - 1) the factors and indicators of life and career skills in 21st century consisted of 6 factors, and 35 indicators— namely, self-direction skills (6 indicators), social and cross-cultural skills (6 indicators), operational skills (6 indicators), digital literacy skills (6 indicators), producing and management skills (6 indicators), and

thinking skills (6 indicators) and 2) The life and career skill in 21st century test has, totally, 105 items. The test has quality evaluated by five experts reveals that the content is reflects the required knowledge for the skills, the reliability of all test items is acceptable, and all six factors demonstrate good construct validity. Factor loadings, according to the first and second confirmatory factor analysis of the factors are reliable. The factors and indicators can be used to set goals, examine, and be used as criteria for life and career skills assessment in higher education students. They can also be used as a guideline for planning education programs effectively and productively, based on students' levels of life and career skills. In addition, the test can be used to measure students' level of life and career skills directly to the set criteria.

Recommendations

Based on the results, the test can be used to measure the levels of life and career skills in various groups of people. For example, to measure the skills of the freshmen to know their strengths and weaknesses of each factor, for planning to improve the skills that are under the threshold; to probe the progress of the skills development in senior students if they are ready for the workforce market after their graduation, and finally to assess employees' performance for more productivity. Lecturers and academic support personnel, moreover, should be recommended to take a training course on the life and career skills to acquire knowledge and understanding, so they can apply them in their lectures or their jobs to develop or support students' potentials appropriately. For further study, there should be a study on factors that hinder the development of these skills in any level of study to obtain data for planning or designing learning activities or for improving a curriculum that responds to the changes in 21st century. However, the test has totally 105 items, which can be a serious threat to reliability and validity, therefore, it is important to clarify significance, purposes and benefits of the test prior to the test administration.

Limitations

There are two limitations of this study. Firstly, the use of the Likert-type-scale test to collect data in Phase 2 made the answers biased as this type of scale has been used to measure the levels of feelings, emotions, or attitudes while responding to the scale. However, the statistical inference and face-to-face data collections without exposing participants' identities can eliminate their concerns and bias. Another limitation is the amount of time it takes to collect data during the Coronavirus disease (COVID-19) outbreak as it required careful handling and management to prevent the spreading of the disease, taking longer than scheduled.

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Authorship Contribution Statement

Chaiyama: Conceptualization, design, analysis, writing, drafting manuscript, critical revision of the manuscript. Kaewpila: data collection, statistical analysis, data analysis and interpretation, document review, technical and material support.

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Appendix

Life and Career Skills in 21st Century Test for Undergraduate Students

Direction: Read each statement carefully and put the checkmark (✓) in the space that responses to your actions or practices. (5 = always true, 4 = usually true, 3 = Neutral, 2 = sometimes true, 1 = rarely true).

Self –Direction Skills		**Self-Awareness**	**5**	**4**	**3**	**2**	**1**
	1	Self-understanding in terms of thinking, feelings, and behavior including strengths, weaknesses, potential, and abilities					
	2	Self-esteem, positive self-assessment, self-value, and pride					
	3	Use experiences that are learned and self-understanding as the basis for learning and understanding others.					
		Curiosity and Self-Directed Learning	**5**	**4**	**3**	**2**	**1**
	4	Interest and willing to take the opportunity to learn on your own and looking for suggestions to improve your understanding.					
	5	Seeking new knowledge and skills related to work and professions for self-improvement continuously.					
	6	Willing to have expertise in knowledge, skills and expanding them to excellence					
		Confidence	**5**	**4**	**3**	**2**	**1**
	7	Have knowledge and expertise in the field of study and skills related to the work responsibilities					
	8	Believe in one's potential and abilities, expecting success in every work responsibility.					
	9	Have a drive and determination to be successful and excellent at the job and being confident of own decisions.					
		Flexible and Resilience	**5**	**4**	**3**	**2**	**1**
	10	Adapt to new challenges according to roles, responsibilities, contexts, situations, and environment in the organization.					
	11	Accept recommendations, suggestions, critics; prompting to improve and open to new methods					
	12	Be able to change plans or actions to deal effectively with changing situations					
		Management of Emotions and Stress	**5**	**4**	**3**	**2**	**1**
	13	Be aware of your own emotions and feelings when changes occur.					
	14	Stay calm and self-control under stressful situations					
	15	Relaxed even when feeling tired from work or duty.					
		Goal-setting & Time Management	**5**	**4**	**3**	**2**	**1**
	16	Decide on what you want and set clear goals to achieve.					
	17	Focus on activities and work carefully and efficiently, being on time according to the established criteria and objectives.					
	18	Create balance in the set goals (both short-term and long-term) and dealing with failures realistically					
Social and Cross-cultural Skills		**Listening**	**5**	**4**	**3**	**2**	**1**
	19	Pay full attention to what others said, taking the time to understand the issues of that listening.					
	20	Ask questions that show an interest in listening to help check to understand the messages.					
	21	Have etiquette of listening, behaving, and expressing the right and appropriate manners.					
		Communication	**5**	**4**	**3**	**2**	**1**
	22	Present information clearly both in front of the audience and or groups of people with confidence.					
	23	Speake clearly with a friendly tone and use body language appropriately.					
	24	Have good eye contact and be able to attract the attention of the person or interlocutor.					

Social and Cross-cultural Skills		**Interpersonal Skills**	**5**	**4**	**3**	**2**	**1**
	25	Open-minded and encourage communication with others at any level, trust to share personal experiences.					
	26	Open to listen to different perspectives or opinions, offer opinions, and answer questions honestly, without hiding.					
	27	Know the right timing to speak on different occasions to create love, understanding, and effective cooperation.					
		Respect for Diversity	**5**	**4**	**3**	**2**	**1**
	28	Respect and accept the roles and duties of others as well as treat them with respect.					
	29	Respect for human dignity, know how to protect your rights, and respect others.					
	30	Accept and work with others who differ in education, society, and culture.					
		Empathy	**5**	**4**	**3**	**2**	**1**
	31	Be aware of the feelings, needs, thoughts, desires, and preferences of others.					
	32	Be able to read the emotions and feelings of others, and understand what others have done.					
	33	Express helpfulness, generosity, and friendliness to others.					
		Responsibility	**5**	**4**	**3**	**2**	**1**
	34	Be aware of your roles, duties, and responsibilities to others and society.					
	35	work successfully and patiently under pressure with effectiveness					
	36	Be responsible for your duties and decisions to provide the best benefits to the organization and society.					
Operational Skills		**Work Independently**	**5**	**4**	**3**	**2**	**1**
	37	Work to the fullest extent of knowledge and ability, check the work carefully to make sure of its completeness and accuracy.					
	38	Accomplish tasks alone, effectively without direct assistance or supervision.					
	39	Complete work on time efficiently according to the quality and standards of work.					
		Cooperation and Team Work	**5**	**4**	**3**	**2**	**1**
	40	Be cooperative, willing to work, and take responsibility for the job appropriately for your own work experiences.					
	41	Commit to work objectives and team activities to effectively achieve the common goals.					
	42	Build good relationships within a group or team, participate in decision-making and problem solving with the team.					
		Negotiation and Conflict Management	**5**	**4**	**3**	**2**	**1**
	43	Be able to use interpersonal communication skills to negotiate effectively					
	44	Be able to be a mediator or coordinator with the potential to explain or give acceptable reasons to deal with conflicts effectively.					
	45	Use interpersonal problem-solving skills to lead the organization towards its goals.					
		Leadership	**5**	**4**	**3**	**2**	**1**
	46	Have a vision and be able to communicate your vision or goals in working with your team or people in the organization.					
	47	Drive and create a positive impact on your work and gain the support and assistance of others.					
	48	Guide and lead the organization towards the desired results and goals effectively.					
		Foreign-language Skills	**5**	**4**	**3**	**2**	**1**
	49	Use the English language in verbal communication appropriately to society, culture, situation, and work.					
	50	Use the English language to communicate for work effectively.					
	51	Use the English language in written communication, pertinently, and correctly.					
		Work ethic	**5**	**4**	**3**	**2**	**1**
	52	Be honest, behave morally, and be a good citizen					
	53	Comply with the social rules and regulations, being disciplined to work reliably.					
	54	Being a role model in desirable behavior, reliability, and being dependable in the performance of duties					

Digital Literacy Skills	**Numeracy**		**5**	**4**	**3**	**2**	**1**
	55	Apply correct basic computation for problem-solving and decision-making.					
	56	Be able to use a statistics application, and to interpret those computed data.					
	57	Be able to present numerical or statistical data in various formats.					
	Technology		**5**	**4**	**3**	**2**	**1**
	58	Be able to use tools, equipment, or technology that are relevant to the job effectively.					
	59	Be able to follow the instructions for use easily, and show a willingness to use the necessary tools or technology.					
	60	Be Skillful in the selection and application of the advantages of modern technology to improve work performance efficiently.					
	Tool and Means of Communication		**5**	**4**	**3**	**2**	**1**
	61	Be able to choose communication applications purposefully and effectively.					
	62	Be part of an online community for information exchange and communication.					
	63	Be able to use communication channels for broadcast or promote information effectively.					
	Internet		**5**	**4**	**3**	**2**	**1**
	64	Be able to use the Internet from various devices for learning and work confidently.					
	65	Be able to store and share files via the web portals such as Google Drive, Dropbox, etc.					
	66	Be able to do transactions via the Internet, such as online banking, online trading, transportation booking, hotel reservation, etc.					
	Search engines and Searching techniques		**5**	**4**	**3**	**2**	**1**
	67	Be able to choose search engines to search for information according to your needs.					
	68	Be able to select suitable searching techniques for retrieving information in various forms via the Internet.					
	69	Be able to download and save the files efficiently.					
	Writing reports and correspondence		**5**	**4**	**3**	**2**	**1**
	70	Be able to use computers and word processors programs to make and print a report efficiently.					
	71	Be able to draft and print a correspondence accurately, clearly, according to the aims of communication.					
	72	Be able to choose the program for sending and receiving letters or e-mails confidently.					
Producing and Management Skills	**Planning and Create a Project**		**5**	**4**	**3**	**2**	**1**
	73	Understand the main objectives or missions of the project and activities to be taken.					
	74	Making a working plan systematically and define the sub-activities to be done.					
	75	Identify the resources needed to produce or provide services to achieve the most cost-effectiveness.					
	Project Management		**5**	**4**	**3**	**2**	**1**
	76	Set clear objectives, goals, and timelines to lead to the success of the project.					
	77	Provide the necessary resources to achieve the goal.					
	78	Prioritize tasks, set a schedule, and manage the project to be successful and achieve the desired results					
	Risk Management		**5**	**4**	**3**	**2**	**1**
	79	Identify the causes of the risk and assess the likelihood and the impact of those risks that will fail the objectives of the project.					
	80	Improve the work system or new working methods to avoid impact or to make it be at an acceptable level.					
	81	Correct the errors or find a way to prevent them from happening again in the future.					

Producing and Management Skills	**Law Literacy**		**5**	**4**	**3**	**2**	**1**
	82	Be aware of, understand, and comply with the laws relating to daily life and work.					
	83	Not taking the works of others as your own or bringing information for use without citation or reference.					
	84	Respect the privacy of others, be courteous, and careful not to violate or interfere with others' work duties.					
	Organization of the workplace		**5**	**4**	**3**	**2**	**1**
	85	Organize and remove unused, unnecessary, or potentially disruptive items from the workplace.					
	86	Regularly maintain equipment to ensure they last longer and prevent deterioration.					
	87	Improve the organization system and follow it regularly					
	Environment & greening		**5**	**4**	**3**	**2**	**1**
	88	Understand the principles, conservation methods, have good ethics, and awareness of environmental conservation.					
	89	Select or allocate resources for use in activities or operations, for the maximum benefit with the least or without impact on the environment.					
	90	Participate in the conservation, restoration, and reuse of natural resources; encourage to have green and shady areas for recreation and relaxation.					
Thinking Skills	**Critical Thinking**		**5**	**4**	**3**	**2**	**1**
	91	Understand the information or what is read, summarize the main points and interpret them effectively.					
	92	Assess the credibility of the information from any sources clearly and accurately.					
	93	Know how to choose the necessary data and information for decision-making and problem-solving.					
	Analytical Thinking		**5**	**4**	**3**	**2**	**1**
	94	Be able to classify, distinguish and prioritize tasks step by step.					
	95	Be able to analyze the relationship of the data, organize and present information clearly and systematically.					
	96	Be rational and know how to use reasoning with information to make effective problem-solving and decision-making.					
	Creative Thinking		**5**	**4**	**3**	**2**	**1**
	97	Be able to apply knowledge, principles, concepts, and new perspectives from other disciplines to the assigned tasks.					
	98	Take the initiative to improve the situation and seek opportunities that may influence the situation and decision-making.					
	99	Invent or innovate jobs or strategies necessary to perform quality work.					
	Problem-Solving		**5**	**4**	**3**	**2**	**1**
	100	Attempt to find the causes of the problem and identify those problems.					
	101	Seek a variety of alternatives or solutions to problems and develop new guidelines for solving those problems.					
	102	Take the necessary actions to solve problems quickly, creatively, and effectively.					
	Decision-Making		**5**	**4**	**3**	**2**	**1**
	103	Be able to evaluate the advantages and disadvantages arising from the alternatives set for solving the problem in the workplace.					
	104	Attempt to choose the best alternatives from various options for the most effective and efficient problem-solving.					
	105	Decide on solving problems with various sources of information.					