

Kwangkyu Lee

## **Entrepreneurship education based on design thinking**

Impacts of education on the development of students' entrepreneurial skills in Korean vocational high schools

## **Entrepreneurship education based on design thinking**

Impacts of education on the development of students' entrepreneurial skills in Korean vocational high schools

Kwangkyu Lee

Master's Thesis

Spring 2023

Master's degree in Education

Entrepreneurship

Oulu University of Applied Sciences

## ABSTRACT

Oulu University of Applied Sciences  
Master's degree in Education Entrepreneurship

---

Author(s): Kwangkyu Lee

Title of the thesis: Entrepreneurship education based on design thinking

Thesis examiner(s): Sari Alatalo

Term and year of thesis completion: Spring 2023

Pages: 62 + 5 appendices

---

In Korea, Entrepreneurship education has escalated at vocational high schools since the national curriculum for primary and secondary schools was published in 2015. Entrepreneurship education was for developing students' mindsets, behaviors, and capabilities, and evaluating processes instead of results was considered an important aspect. Design thinking was also defined as a non-linear, iterative process that groups use to understand users, challenge assumptions, redefine problems, and create innovative solutions for prototypes and tests.

This thesis aimed to understand the concept of entrepreneurship education based on design thinking and discover its impacts on the development of entrepreneurial skills by collecting the various views of students. As a diary-based thesis, all the tasks that have been implemented in this study were conducted at Jeju Girls Commercial High School in Korea. Student diaries were used to collect qualitative data from 54 female senior students, and teacher diaries, which were written autobiographically, were also gathered for supplementary resources.

The instructor planned 7 weeks of intensive design thinking courses, which were comprised of Introduction, Empathize, Define, Ideate, Prototype, Test, and Presentation in reference to Standard's Design School Bootcamp manual. For data analysis, thematic analysis was used by searching across data sets to find repeated patterns of meaning.

The result of the design thinking course was that students showed distinct improvements in entrepreneurial skills in accordance with the five stages of design thinking. In terms of entrepreneurial skills, students stated that management skills, entrepreneurial skills, personal maturity skills, interpersonal skills, and literacy skills were developed after the course. To be more specific, students developed organizing, summarizing, higher-order thinking skills, and problem-solving skills in the theme of management skills. In regards to entrepreneurship skills, environmental scanning, developing a concept, and networking ability were improved. Moreover, emotional coping, self-awareness, and creativity were advanced with regard to personal maturity. Finally, empathy ability, communication skills, teamwork, leadership, and listening skills were improved as interpersonal skills, and literacy skills such as presentation skills, information search skills, and computer literacy were promoted. In particular, this study also described characteristics of vocational high school students observed throughout the entire class.

This thesis proposes ways in which vocational high schools in Korea can move forward in their journey of enhancing entrepreneurship education strategies.

---

Keywords: Entrepreneurship education, Design thinking, Entrepreneurial skills, Vocational high school students

# CONTENTS

1	INTRODUCTION .....	4
2	DESCRIPTION OF THE CURRENT STATE .....	6
2.1	Vocational education in Korea .....	6
2.2	Entrepreneurship education in Korea .....	9
2.3	Introducing the school .....	11
2.4	Outlining the school's stakeholders and their interests.....	13
2.4.1	Students .....	13
2.4.2	Teachers .....	14
2.5	Describing the school's competence requirements for stakeholders .....	15
2.6	Describing the author's task and competence requirements.....	15
2.7	Describing the author's stage of professional development and development needs .....	17
2.8	Theoretical background .....	18
2.8.1	Entrepreneurship education.....	19
2.8.2	Design thinking .....	19
2.8.3	Entrepreneurial skills.....	21
3	PURPOSE AND OBJECTIVES .....	25
3.1	Purpose of the thesis and learning objectives .....	25
3.2	Data collection process .....	26
3.3	Data analysis process.....	28
4	DESCRIPTION OF WORK TASKS AND LEARNING AS DIARY ENTRIES.....	34
4.1	Planning the course.....	34
4.2	Implementing the course.....	36
4.2.1	Week 1: Introduction to design thinking .....	36
4.2.2	Week 2: Empathize .....	38
4.2.3	Week 3: Define.....	40
4.2.4	Week 4: Ideate.....	42
4.2.5	Week 5: Prototype.....	45
4.2.6	Week 6 and 7: Test and Presentation .....	47
5	CONCLUSION AND REFLECTION .....	50
5.1	Conclusion.....	50
5.2	Reflection.....	54
5.3	Discussion .....	56
5.4	Further study .....	56

REFERENCES .....	57
APPENDICES .....	63

# 1 INTRODUCTION

In Korea, many schools have started entrepreneurship education after the national curriculum for primary and secondary schools was announced in 2015. Entrepreneurship education is a future-oriented education that provides entrepreneurship opportunities with a sense of ownership (Ko & Hong, 2016). From the perspective of career education, it also brings an entrepreneurial mind as a founder, not a vocational education for employment. Song (2014) also states that entrepreneurship education is an education that cultivates convergence, creativity, and complex problem-solving abilities to discover problems, solve them, and implement them. However, current 'Introduction to Entrepreneurship' textbooks for vocational high school students in Korea only contain practical knowledge for establishing a start-up, even though they deal with the ideation part of making their own products or services.

Entrepreneurship education based on design thinking can actively address social problems and develop positive social skills with other people (Choi, 2018). In addition, it has the characteristic of exploring problems from the user's point of view, implementing them as actions to solve them, and iteratively revising them. It encourages the experience of numerous trials and errors through the process of creating and testing a viable alternative prototype. By acknowledging that the problem cannot be completely solved through one process and repeating the process of finding a better solution again, the fear of failure can be overcome and creative confidence can be gained (Byun, 2015; Kelly & Kelly, 2013). Therefore, design thinking may not be an introductory lecture in a fiercely competitive society, but learning by doing through trial and error to solve problems.

In addition, entrepreneurship education based on design thinking is expected to contribute to education that enables people to grow as members of society while establishing human relationships through successful communication and solving problems they find as active participants who are not afraid of mistakes. Following the aforementioned, the present study aims to discover the effects of entrepreneurship education based on design thinking for vocational high school students. There were several previous studies about entrepreneurship education and design thinking, but most of these studies were aimed at general high school or university students. As a result, I could not find research about entrepreneurship education based on design thinking for vocational high school students. Moreover, I was very interested in design thinking when I took a Service design and innovation course at Oulu University of Applied Science in 2021. During the course, I wanted to adapt design thinking to the Introduction to Entrepreneurship subject that will be offered in my vocational high school in 2022 and know the effects of entrepreneurship education based on design thinking for my vocational school students.

As a vocational high school teacher, I wanted to find out the relationship between design thinking and the Introduction to Entrepreneurship subject and how an entrepreneurship education course based on design thinking impacts the development of entrepreneurial skills. Fortunately, I was going to teach 'Introduction to Entrepreneurship' in my school in 2022, so I thought that it was a good chance to study about it. Therefore, more specifically, the research question is:

“How does an entrepreneurship education course based on design thinking impact the development of entrepreneurial skills for vocational high school students?”

This thesis followed a diary-based design with an in-depth analysis of a qualitative nature. The research data in this thesis was drawn from two main sources, which were student's diaries and teacher's diaries, and this project was conceived during my entrepreneurship lesson in 2022. The overall structure of the study took the form of five chapters, including this introductory section. The second chapter began by laying out the theoretical dimensions of the research focusing on vocational education and entrepreneurship education in Korea and looked at the school's stakeholders and competence requirements. The third chapter was concerned with objectives and the methodology used for this research. The fourth section presented the findings of the project, focusing on the implementation of the entrepreneurship course based on design thinking step by step. The final section drew upon the entire thesis and gave a conclusion with a brief summary and reflection. Therefore, this study aims to contribute to this growing area of research by exploring the impacts of entrepreneurship education based on design thinking in vocational high schools in Korea.

## 2 DESCRIPTION OF THE CURRENT STATE

In this chapter, this document explores the current system of vocational education and entrepreneurship education in Korea. Jeju Girls' Commercial High School, at which I have been working, is introduced as the host for all the projects conducted. In order to understand in depth, this study describes the school's stakeholders and competence requirements, as well as the author's task and competence requirements. Finally, the existing literature on the topic of entrepreneurship education, design thinking, and entrepreneurial skills is presented as a theoretical background.

### 2.1 Vocational education in Korea

According to the national curriculum for the primary and secondary schools in Korea (Ministry of Education, 2015), a vocational high school is an educational institution that offers specialized training and instruction, focusing on practical skills and knowledge needed for specific occupations or trades. It can encompass either secondary education or upper-secondary education, aiming to equip students with the technical expertise and vocational skills necessary to perform specific job roles effectively. In these specialized high schools, students get ready to enter the workforce as skilled workers at a fundamental level while also preparing for advanced education.

There are three types of vocational high schools in Korea: Specialized high schools, Vocational classes in general high schools, and Customized high schools for industrial demand. A specialized high school aims to train students in specific fields and support them in finding good jobs through education tailored to each student's aptitude and talent. These schools are specialized in a certain vocational field, such as Business, Agriculture, Engineering, Technology, Fishing, Marine transportation, and so on. According to school statistics (KERIS, 2023), the number of specialized high schools in 2022 was 464, which accounts for about 80.0% of vocational high schools. The total number of students from specialized high schools in 2022 was 153,891.

A vocational class in general high school is established for students who want to learn vocational skills instead of going to the university after graduation. Some students drop out of general high school because they are not interested in studying general subjects such as Math, English, Science, and so on. As a result, some schools have started opening vocational classes for students who want to learn a certain vocational subject, such as Beauty, Nursing, Cooking, and so on. The number of high schools that have vocational classes was 63, which accounted for 10.9%, and there were 8,456 students in 2022 (KERIS, 2023).



Customized high school for industrial demand, which is called 'Meister high school' in Korea, is a special purpose high school that nurtures young technical masters in connection with specialized industry demands in promising fields. The curricula are developed in coordination with local companies and incorporate industrial internships. The teaching faculty includes industry experts. The number of customized high schools for industrial demand in 2022 was 53 and accounted for 9.1%. The students from the customized high school for industrial demand were 14,716 in 2022 (KERIS, 2023).

According to the national curriculum for primary and secondary schools (Ministry of Education, 2015), vocational high schools belong to secondary schools in Korea. Secondary education in Korea consists of a three-year course after graduating from middle school. On average, secondary school students range in age from 16 to 18. In order to understand the curriculum, it is divided into general subjects, specialized subjects, and creative experience activities.

The general subjects in the curriculum encompass four main areas: Foundation, Inquiry, Physical Education/Arts, and Life/Liberal Arts. These subjects are further divided into specific subject clusters. The clusters include Korean Language, Mathematics, English, Korean History, Social Studies (including History and Moral Education), Science, Physical Education, Arts, Technology, Home Economics, Foreign Language, Classical Chinese, and Liberal Arts. Within the general subjects, there are both compulsory and elective courses. The compulsory courses comprise common courses that every student must take, such as Korean Language, Mathematics, English, Korean History, Integrated Social Studies, and Integrated Science (which may include Science Laboratory Experiments). On the other hand, elective courses offer students the choice between general elective courses and career-related elective courses, allowing them to explore their interests and focus on specific areas of study.

On the other hand, Specialized subjects in the curriculum are aligned with national competency standards and cover a wide range of fields. These specialized subjects include Management/Finance, Public Health/Public welfare, Design/Cultural Contents, Beauty Treatment/Tourism/Leisure, Food cooking, Construction, Machinery, Materials, Chemical Engineering, Textile/Clothing, Electric/Electronic, Information/Communications, Food processing, Printing/Publishing/Crafts, Environment/Safety, Agriculture/Fisheries & Maritime, and Ship operations. Students have the opportunity to select specialized subjects based on their individual interests or career aspirations. This allows them to focus their studies and acquire in-depth knowledge and skills in their chosen field. By offering a variety of specialized subjects, the curriculum aims to provide students with practical training and preparation for specific industries or professional paths.

Finally, creative experiential activities encompass discretionary activities, club activities, community services, and activities related to career exploration. For example, the discretionary activity is labour and human rights education, sex education, environmental education, and so on. The club activity is like a student club such

as a climbing club, a literature reading club, a broadcasting club, and so on. The community service means a volunteer activity in school and out of it. The career exploration activity is a course with career exploratory tests and counselling. It is possible to organize creative experiential activities within 24 units at the discretion of the principal.

To fulfil the high school curriculum, a minimum of 204 units is required. These units comprise 180 units dedicated to subjects or subject clusters, and an additional 24 units (equivalent to 408 instructional hours) allocated for creative experiential activities. According to unit allocation regulations in vocational high school, one unit is equivalent to taking 17 times of 50-minutes lesson. Schools arrange the subjects that students need to complete throughout their three years of high school according to grades and semesters, and they share this information with parents and students. In addition to that, most vocational high schools utilize learning modules created by the Ministry of Education and the Korea Research Institute for Vocational Education and Training. These modules are developed based on Korea's national competency standards(NCS) framework.

In Korea, the national curriculum for the primary and secondary schools undergoes revision approximately every seven years, and the new national curriculum would be revised in 2022. It was the last year to apply the curriculum standards enacted in 2015 for vocational high schools. Table 1 depicts the curriculum organization and implementation for vocational high school in Korea, which extracts from the national curriculum for primary and secondary schools in 2015.

*Table 1. Unit allocation in vocational high school in Korea from the National Curriculum for the Primary and Secondary Schools (Ministry of Education, 2015)*

		<b>Subject Areas</b>	<b>Subjects (Subject Clusters)</b>	<b>Common Courses (Units)</b>	<b>Required Units</b>	<b>Autonomous Implementation Units</b>
Subjects (Subject Clusters)	General Subjects	Foundation	Korean Language	Korean Language(8)	24	Individual schools design their curriculum, taking into consideration the aptitudes and career plans of their students.
			Mathematics	Mathematics(8)		
			English	English(8)		
			Korean History	Korean History(6)	6	
		Inquiry	Social Studies (including History / Moral Education)	Integrated Social Studies(8)	12	
			Science	Integrated Science(8)		
	Physical Education	Physical Education	8			
	Arts	Arts	6			

	Life Liberal Arts	Technology Home Economics / Second Foreign Language / Classical Chinese / Liberal Arts	10	
		Subtotal	66	28
	Specialized Subjects II	17 Subjects (Clusters) or more	86	
		Creative Experiential Activities		24
		Total Units		204

For more information, there are two types of specialized subject: specialized subject I , specialized subject II . Specialized subject I is a subject for students who study in special-purpose high schools such as science high school, arts high school and physical education high school. On the other hand, specialized subject II is a subject for students who study in vocational high school.

Graduates are awarded certificates of graduation that are formally equivalent to high school diplomas from other types of schools and that provide access to tertiary education. However, many graduates on the vocational track pursue higher education. They prefer to continue their studies at junior colleges or four-year universities. In 2023, the Ministry of Education and the Korean Educational Development Institute published the findings of the employment statistics survey conducted for graduates of vocational high schools in 2022. According to school statistics, the employment rate of vocational high school graduates was 57.8% in 2022 (KERIS, 2023).

## 2.2 Entrepreneurship education in Korea

After the national curriculum for the primary and secondary schools was announced in 2015, entrepreneurship education became the first step in the regular curriculum in Korea. Before that, most of the entrepreneurship education in vocational high schools was conducted through creative experiential activities in an one-day class or a special lecture from an external instructor. However, as can be seen in Table 2, vocational schools specialized in a business field have opened 'Introduction to Entrepreneurship as an elective subject in specialized subject II since 2015.

Table 2. Specialized subject II in vocational high school in Korea from the National Curriculum for the Primary and Secondary Schools (Ministry of Education, 2015)

Subjects (Subject Clusters)	Common Special Subjects	Courses		Major
		Foundational Courses	Practical Courses	
Management/ Finance	Succe ssful Life in the Work	Commercial Economy Business & Management Office Management Accounting Principles Accounting Information Processing System Enterprise Resource Planning General Tax Investigation General Product Distribution International Management Business English General Finance General Insurance Marketing & Advertising <u>Introduction to Entrepreneurship</u> Communication General E-Commerce	General Affairs Labour Management Secretarial Work Human Resource Office Administration Budget and Funds Accounting Practice Taxation Business Practices Purchase and Supply Materials Management Process Management Quality Control Supply Chain Management Logistics Management Export and Import Management Place-of-Origin Management Distribution Management Bank Teller Practice Credit Card Sales Stock Trading Trade Finance Insurance Solicitation Damage Assessment Customer Management E-Commerce Practices Store Sales Door-to-Door Sales	Management/ Office Management  Finance/ Accounting  Product Distribution  Finance  Sales

In 2022, the Ministry of Education in Korea started the high school credit system, which allowed students to select subjects according to their career and aptitude based on their basic knowledge and academic background. It was a system for graduating by acquiring and accumulating credits for subjects that had met the completion standards. As a result, not only students who were specialized in a business field but also students who were specialized in other majors in vocational high school could choose 'Introduction to Entrepreneurship as an elective subject.

In Korea, 17 municipal ministries of education are in charge of approving the textbooks for the specialized subject I and specialized subject II. In 2018, Gyeonggi-do provincial office of education approved 'Introduction to Entrepreneurship' textbooks from seven publishers, which were Mentor-School, Sung Rim-Publishing, C-mass, Woong Bi-Publishing, EO-books, Seoul-Textbook, and Samyang Media. Although the publishers and authors were different for each publishing company, the contents were almost similar because the Ministry of Education gave guidelines to publishers for publishing textbooks. Table 3 shows the

contents of the 'Introduction to Entrepreneurship' textbook, which was published by Samyang Media. This text was used in Jeju Girls Commercial High School where the data were collected for this study.

*Table 3. Contents of 'Introduction to entrepreneurship' Textbook in Korea from Samyang Media (Lee & Seo, 2019)*

Chapter	Title	Sub-title
Chapter 1	Understanding of Entrepreneurship	1.1 Definition of entrepreneurship 1.2 Entrepreneurial success factors 1.3 Entrepreneurship mindset 1.4 Enterprise ethics
Chapter 2	The process of start-ups	2.1 The basic process of start-ups 2.2 Business feasibility analysis 2.3 Start-ups establishment and business registration 2.4 Procurement and operation of start-ups funds
Chapter 3	Tax for Start-up	3.1 Taxes for individual businesses 3.2 Taxes for corporation 3.3 Benefits for start-ups
Chapter 4	IPRs (Intellectual property rights) and Ideation	4.1 Industrial property right 4.2 Newly emerging IPRs 4.3 Ideation
Chapter 5	Business plan	5.1 Understanding of business plan 5.2 Process of business plan 5.3 Composition and contents of business plan 5.4 Writing a business plan
Chapter 6	Start-ups case study	6.1 Internet business start-ups 6.2 Services business start-ups 6.3 Production and distribution business start-ups

As can be seen in the titles and sub-titles of 'Introduction to Entrepreneurship', subjects were divided into two parts: Entrepreneurship and start-up business. In the first chapter, students understood entrepreneurship as an entrepreneur. From chapter 2 to chapter 6, students learned how to establish start-ups in Korea. It contained processes for start-ups, taxes, IPRs, business plans, and so on. In particular, students could gain indirect experience with a variety of business types from the start-up case study in Chapter 6 of the book. However, Schmidt, Soper, and Facca (2012) said that creativity is a critical skill for entrepreneurs and entrepreneurs education. Therefore, I think that it will be better to contain an ideation part for creativity, including practical knowledge for establishing a start-up, in the textbook..

### **2.3 Introducing the school**

In accordance with Jeju Girls Commercial High School (2023), this high school is one of the main public vocational high schools, which is a specialized high school in Jeju. Jeju is the biggest island in Korea, located in the southern part, and its population will reach 677,090 people in 2023 (KOSIS, 2023).

In Korea, it is mandatory to publish guidelines for school curriculum and school management on the internet every year, which is called 'School Info'. It shows that the school was established in 1966 and had 19,100 alumni. Furthermore, it specialized in the commercial field and operated three majors: Accounting and Finance, Global distribution, and Office management (KERIS, 2022). The school's vision was to be a happy school where dreams and hopes come true. The educational goal was to cultivate creative talents to lead the 4th Industrial Revolution era. In the table below, the total number of classes and their distribution among the three departments of the school can be seen.

*Table 4. Class organization of Jeju Girls Commercial High School from School Info (KERIS, 2022)*

	<b>Department</b>	<b>1<sup>st</sup> year</b>	<b>2<sup>nd</sup> year</b>	<b>3<sup>rd</sup> year</b>	<b>Total</b>
The number of class	Accounting & Finance	3	3	3	9
	Global distribution	2	2	2	6
	Office Management	3	3	3	9
	Total	8	8	8	24

The department of Accounting and finance fosters competent professionals in the field by supporting the development of skills to understand and analyze accounting business processing and financial information for business management. Students obtain certificates in relation to accounting and finance, such as computational accounting certificates, computational tax certificates, fund investment consultant licenses, securities investment consultant licenses, and so on.

With the opening of the international market in the global era, the retail industry is developing rapidly. Therefore, the global distribution department at Jeju Girls' Commercial High School trains competent international trade specialists who could handle retail information in various distribution, sales, and management areas while engaging in domestic and overseas distribution-related tasks. Students obtain certificates such as distribution manager, sales manager, logistics manager, and so on.

Finally, the office management department trains professionals in the fields of business, support, and sales. Like this, students gain the knowledge and practice necessary to perform in business and office management-related positions. Students obtain certificates in relation to office work, such as Computer Utilization ability certificates, Word Processor certificates, Service Management qualifications, and ERP Information Manager licenses, and so on.

## 2.4 Outlining the school's stakeholders and their interests

### 2.4.1 Students

According to KERIS (Korea Education and Research Information Service) in 2022, which is a public institution under the Korean Ministry of Education that promotes various projects and academic research related to information and communication technology in education, the number of students at Jeju Girls Commercial High School is currently 584, of which 206 are first-year students, 185 are second-year students, and 192 are senior students. The exact number of students in each major and each year can be seen in Table 5.

Table 5. Status of students at Jeju Girls Commercial High school in 2022 from School info (KERIS, 2022)

	Major	1 <sup>st</sup> year	2 <sup>nd</sup> year	3 <sup>rd</sup> year	Total
The number of students (Female)	Accounting & Finance	78	68	73	219
	Global distribution	50	47	47	144
	Office Management	73	70	72	220
	Total	206	185	192	583

After graduation, as can be seen in Table 6, about 67.0% of graduates went to college or university, while 22.1% of students got a job in 2021 (Ministry of Education and Korean Educational Development Institute, 2023). Even though the rate of employment after graduation was not high at that time, some students were still interested in getting a job. In particular, most of the graduates employed found employment in fields related to their majors. However, 10.8% of graduates went on to other careers. For example, they were preparing for enrolment in a university or certificate other than their major. Some graduates were waiting for or preparing to get a better job as well. Furthermore, a small percentage of students were also interested in entrepreneurship because they wanted to run their own business in the future.

Table 6. Status of graduates from Jeju Girls Commercial High School in 2021 from School info (Ministry of Education & Korean educational development institute, 2023)

	Major	Graduates	Graduates enrolled in college or university	Graduates employed	Another career
The number of students (Female)	Accounting & Finance	77	44 (57.1%)	25 (32.5%)	8 (10.4%)
	Global distribution	52	36 (69.2%)	10 (19.2%)	6 (11.6%)

Office Management	74	56 (75.7%)	10 (13.5%)	8 (10.8%)
Total	203	136 (67.0%)	45 (22.2%)	22 (10.8%)

## 2.4.2 Teachers

The total number of teachers at Jeju Girls Commercial High School was 56 in 2022 (KERIS, 2022). Half of them were teaching specialized subjects that were related to business administration, such as accounting, trade, or marketing. All of them had a commercial teacher license. Although there were three departments at school, teachers who taught specialized subjects could teach all of the students who belonged to the three departments because all majors were based on business management. However, there was a unique point: all commercial teachers could not transfer to other public schools because this school was the only public high school in Jeju City. One more interesting thing is the demography of the teacher group. When I investigated an age group of commercial teachers at Jeju Girls Commercial High School, the 55 to 60 age group of commercial teachers accounted for about 65.0%, and they were going to retire within 5 years. It means that they have at least 30 years of teaching experience. On the other hand, the other half of the teachers taught general subjects such as Korean language, English, Math, and so on, and they were distributed across all age groups from 20s to 60s. For reference, the retirement age of teachers in Korea is 63 years old on average. Regarding teaching Entrepreneurship, I was the only teacher to teach Entrepreneurship because the subject 'Introduction to Entrepreneurship' was first assigned to our curricula in 2022.

In general, when teachers decide their subject, they hold curriculum committees before starting the spring semester, which is usually in the middle of February. At first, teachers apply for subjects that they want to teach, and then the curriculum committees collect the applications and debate subject allocation. After that, the committees notify the teachers about the results of the subject distribution. Some teachers complain about this process and have trouble with the curriculum committees.

In 2022, I was the only teacher who applied to teach 'Introduction to Entrepreneurship.' The reason why this subject was not popular among teachers in my school was that this was the first year to teach Entrepreneurship. Usually, teachers preferred to teach the subject they had taught before. In addition, 'Introduction to Entrepreneurship' was open only for 3 classes because it was an elective subject, so only one teacher was assigned to teach this subject.



## **2.5 Describing the school's competence requirements for stakeholders**

There are some competence requirements for the school's stakeholders: teachers, the regional community, and students. First, the school organizes and operates a differentiated student-centered curriculum according to changes in the goals of vocational education. In order to improve the specialization mindset and build an infrastructure for promoting specialization, the school strengthens the training of teachers in the specialized field and continuously improves teaching and learning methods for teachers to meet the needs of students.

Furthermore, the school strengthens its publicity by expanding educational facilities and improving the educational environment to increase trust in the local community and lay the foundation for attracting excellent new students. Through the establishment of an industry-university cooperation system related to specialized industries, the department's professionalism and the competitiveness of the school will be enhanced.

Finally, the school plays an important role in helping students develop certain competencies before they enter college or get a job. According to Marlborough School (2019), which is a private middle and upper school for girls located in the heart of Los Angeles, there are five benefits to teaching entrepreneurship. Marlborough School mentions that entrepreneurship education helps students prepare for an uncertain future and encourages creativity, innovation, and collaboration. In addition, it teaches problem identification and develops passion and sustained persistence applied toward long-term achievement.

## **2.6 Describing the author's task and competence requirements**

I taught 'Introduction to Entrepreneurship' to senior students who are majoring in office management in 2022. The spring semester began on March 2 and concluded on July 19, 2022. Furthermore, the fall semester started on the 16th of August and finished on the 3rd of January in 2023. The total duration was at least over 180 days for a year, which were the minimum days for graduation. This course was worth 3 credits in this spring semester of my third year, which means taking a 50-minute class once a week for 17 weeks.

'Introduction to Entrepreneurship' contained the pre-learning contents of the NCS (National Competency Standards) practical course, and this subject could cultivate various procedures for starting a business, tax handling methods, and business plan writing skills as well. The objectives of this subject were to help students develop the ability and attitude to actively perform business activities as entrepreneurs by acquiring

professional knowledge about start-ups. Table 7 standardizes competency requirements for students in 'Introduction to Entrepreneurship (Ministry of Education, 2015).

*Table 7. Competency requirements for Introduction to Entrepreneurship from The National Curriculum for the Primary and Secondary Schools (Ministry of Education, 2015)*

Chapter	Title	Competency requirement
Chapter 1	Understanding of Entrepreneurship	Students can explain the meaning and success factors of starting a business, and can explain entrepreneurship and business ethics to others by giving examples.
Chapter 2	The process of start-up	Students can present the procedure for starting a business and analysis items for business feasibility, and to explain to others the procedures related to company establishment, business registration, and procurement and operation of start-up funds with examples.
Chapter 3	Tax for Start-up	Students can understand the taxation system for starting a business, present the procedures for calculating and withholding income tax, and perform tasks related to the calculation of corporate tax and tax benefits and reduction systems, and give examples to others on how to do it can be explained by listening.
Chapter 4	IPRs (Intellectual property rights) and Ideation	Understand the meaning and types of industrial property rights and new intellectual property rights, and be able to carry out the process of idea creation and idea evaluation, and explain the related procedures to others with examples.
Chapter 5	Business plan	Students can understand the necessity of a business plan, and write a business plan according to its components, and explain the process to others by giving an example.
Chapter 6	Start-up case study	Students can perform related tasks by analyzing the current status of start-ups and success factors, and explain this process to others by giving examples.

In Korea, it is possible to delete, add to, or change the curriculum at the discretion of the teacher. Therefore, I added a supplementary curriculum that was about design thinking and set a competency requirement for my thesis. The added title was design thinking, and the competency requirements I had made were that students could solve current problems and develop a new product or service by using design thinking tools. As a result, students were required to be able to develop the ability and attitude to actively perform business activities as entrepreneurs through this course.

In terms of competence requirements, I have developed my ability to become a good facilitator. As both a facilitator and a teacher, which is a coach to help students make innovative and productive thinking in groups, it is necessary to focus on the students throughout the process and work to uncover the new insights and

ideas that might not be revealed through the process. According to Voltage Control (2021), a great facilitator should possess the following five qualities:

- Confidence: Ability to control the class room and keep students interested and engaged.
- Humility: Knows how to focus on helping the team achieve its purposes.
- Flexibility: Comfortable course-correcting during the meeting if things change, students want something different, or the subject needs to be changed.
- Curiosity: Being interested in their customer's problems, product, or challenge and excited to learn more about it.
- Experience: Has successfully led gatherings for clients before.

Therefore, these five qualities could be competence requirements for my task. Additionally, Voltage Control (2021) also mentioned that the following nine skills are also necessary for facilitating effective meetings as a good facilitator.

- Advanced preparation
- Clear communication
- Active listening
- Asking questions
- Timekeeping
- Establishing a psychologically safe environment for sharing
- Creating focus amongst the group
- Unbiased objectivity
- Managing the group decision process.

Above all, I thought that preparation for the design thinking lesson was very important. Literature reviews from all over the world, preceding lesson plans from other teachers, and consulting with professionals could be required arrangements for designing lessons successfully..

## **2.7 Describing the author's stage of professional development and development needs**

I majored in English education and Business administration as a minor at university in Korea. As a result, I got two certificates for teaching English and Commercial. After graduation, I became a vocational teacher and have been working as a commercial teacher for over 10 years at vocational high schools in Seoul and Jeju, Korea. I usually teach business subjects such as accounting, marketing, finance, and so on.

Currently, I am an entrepreneurship teacher at Jeju Girls Commercial High School and will teach 'Introduction to Entrepreneurship' to seniors in 2023. As a part of my role in my school, I have been in charge of a curriculum administrator at my school, monitoring all assessment plans and syllabuses, and managing subjects that have been opened in my school since 2023. In addition, I have been taking part in the Entrepreneurship Academy, which is operated by the Jeju Special Self-Governing Provincial Office of Education in Korea, as a guidance tutor since 2021. Recently, the Ministry of Education in Korea encouraged teachers to teach entrepreneurship to high school students, and the superintendent of education in Jeju also supports the importance of entrepreneurship education. Therefore, in order to make the subject 'Introduction to entrepreneurship' more relevant and holistic, I have been studying how to teach entrepreneurship and develop it for vocational high school students.

In terms of competencies, I have been developing my entrepreneurship literacy, which means the ability to understand the terminology and the latest trends about start-ups and entrepreneurship education. This competency has an important role in teaching and designing an entrepreneurship course. For instance, I have operated entrepreneurship student clubs for over 6 years and took part in teacher workshops about entrepreneurship education for 30 hours in 2019 and 2022. To study more, I applied for this master's program in Education Entrepreneurship at Oulu University of Applied Sciences in 2021 and completed Education (10 ECTS), Service design and innovation management (10 ECTS), and Business and entrepreneurship (10 ECTS) in 2022.

The development needs for this study can include self-reflection and innovative thinking. To achieve the objective of the study, which is about the impacts of entrepreneurship based on design thinking in depth for vocational high school students, I think that I should concentrate on the feedback from students, teachers, and various stakeholders. Through their feedback, it is possible for me to reflect and elaborate on a customized curriculum for 'Introduction to Entrepreneurship'. For developing the specialty curriculum for vocational high school students, I think that innovative thinking is also necessary based on self-reflection.

## **2.8 Theoretical background**

In this diary-based thesis, the research question is to find out what kinds of entrepreneurial skills are developed after vocational high school students take the entrepreneurship education course based on design thinking. Before starting the studies, it is a good idea to know the precedent research about the concepts of entrepreneurship education, design thinking, and entrepreneurial skills. From the previous studies, it is helpful to understand the terminology the author uses in this thesis and its relevance among them. In the end, this theoretical background enriches this study and is the main key to deriving a conclusion.

### **2.8.1 Entrepreneurship education**

Entrepreneurship education aims to cultivate students' mindsets, behaviours, skills, and capabilities with the goal of fostering future entrepreneurs (Chang & Rieple, 2013). Traditionally, entrepreneurship education has revolved around a predefined problem that can be solved through a problem-solving process. Additionally, students are often required to generate a business idea quickly at the beginning and then engage in planning and prediction activities to demonstrate economic feasibility by the end of the course (Daniel, 2016). Consequently, many current courses still rely on business plans as a means of teaching entrepreneurship, emphasizing planning and accountability (Honig, 2004). According to Daniel (2016), the most prevalent teaching method in entrepreneurship education is lecturing, sometimes supplemented with guest speakers (Seyedi, Moradnezehadi & Mehdizadeh, 2021).

Several studies indicate that basic entrepreneurship courses that primarily concentrate on business plans can have a negative impact on students' intentions to start their own ventures (Carrier, 2005; Von Graevenitz, Harhoff & Weber, 2010). Conversely, courses that focus on developing a range of skills and competencies show that students are more likely to establish their own start-ups (Nabi, Liñán, Fayolle, Krueger & Walmsley, 2017). In response to traditional entrepreneurship education, Neck and Greene (2011) argue that the emphasis should be on how to take action, predict outcomes, and generate ideas for an uncertain future. One potential approach to achieving this is by incorporating design thinking into school curricula (Nielsen & Stovang, 2015). Consequently, shifting the focus to the process rather than the final output also changes the criteria for evaluation. Instead of grading the business plan itself, the process should be evaluated. One effective method for capturing the learning process is through the use of a written reflection log (Musu-Gillette et al., 2016).

Furthermore, the primary objective of entrepreneurship education is not solely to establish new businesses but rather to enable students to develop entrepreneurial abilities, attitudes towards entrepreneurial behaviour, entrepreneurial intentions, and the behaviour itself (Fayolle, Gailly, & Lassas-Clerc, 2006). There has been a debate regarding the shift from teacher-centred to student-centred education in entrepreneurship education (Daniel, 2016; Musu-Gillette et al., 2016). Moreover, there has been a discussion about the potential future of entrepreneurial education as a methodological approach based on design thinking (Val et al., 2017).

### **2.8.2 Design thinking**

Design thinking is a complex thought process that involves conceiving new realities and integrating design culture and its methods into areas such as innovation and business (Val et al., 2017). It strives to find a balance between business and art, intuition and logic, and concept and execution. Moreover, design thinking

places emphasis on understanding and addressing people's needs and desires, applying creative solutions to their problems (Daniel, 2016; Neck & Greene, 2011). It also encourages students to connect inspiration and conceptualization in order to solve problems (Micheli, Wilner, Bhatti, Mura & Beverland, 2019). It is important to note that design thinking can be seen as a fusion of thinking, knowledge, and action in the real world (Kimbell, 2011). Thus, design thinking can be perceived as thinking through doing and doing through thinking. Furthermore, the current approach to design thinking in entrepreneurship education shifts from teacher-centred learning to a more student-centred approach (Daniel, 2016; Musu-Gillette et al., 2016).

In general, design thinking uses convergent and divergent thinking at each stage in a situation where a problem is complex and there is no solution (Chasanidou, Gasparini, & Lee, 2015). At the beginning of the design thinking process, it is mandatory to identify their problems and then develop a problem-solving plan. Students analyse the situation and allow their team members involved in the project to reflect on their own processes at all stages of the process. The problem-finding and problem-solving processes help to create various ideas to generate new and creative solutions for problems.

Several researchers have explored and presented different models of the design thinking process. IDEO, a prominent design and consulting firm in the U.S., proposed a system of overlapping spaces: inspiration, ideation, and implementation (Gonen, 2020). This framework involved engaging in problem or opportunity exploration, observing, generating ideas through brainstorming, testing ideas through prototyping, and determining how to bring the product to market. Additionally, Stanford's design school's bootcamp bootleg (2009) presented a five-step design process: empathize, define, ideate, prototype, and test. This model emphasized understanding users' needs, defining the problem, generating ideas, creating prototypes, and testing them. Moreover, Beckman and Barry (2007) discussed the innovation process associated with design thinking, which includes four stages: generating observations, developing frameworks, establishing imperatives, and proposing solutions. Lawson (2006) also introduced a design thinking model that comprises five groups of activities and skills: formulating, moving, representing, evaluating, and reflecting. Lastly, Liedtka and Ogilvie (2011) provided a structure for design thinking projects in a business context, using four questions: What is?, What if?, What wows?, and What works?

To summarize, all of these models share a similar process. They begin by understanding the real problems faced by users in their everyday lives and empathizing with them through observation and understanding. This is followed by defining the perceived problem and generating a range of possible solutions through ideation. From there, the process moves on to prototyping the solutions and testing them. It is important to note that the phases of design thinking are applied iteratively, meaning that some phases may be revisited multiple times before a viable solution is achieved (Glen, Suciu, Baughn & Anson, 2015).

### 2.8.3 Entrepreneurial skills

In previous studies on entrepreneurial skills, researchers have provided various definitions and classifications of these skills. Ladzani and Van Vuuren (2002), for instance, classified entrepreneurial skills into six categories: creativity, innovation, risk-taking, identification of opportunities, the ability to envision growth, and the ability to learn from successful entrepreneurial role models. They also suggested that entrepreneurship training should cover motivation, entrepreneurial skills, and business skills, as the degree of entrepreneurship was found to be influenced by dimensions such as innovativeness, risk-taking, and proactiveness (Morris, Kuratko & Schindehutte, 2001). These classifications and dimensions help to understand the multifaceted nature of entrepreneurial skills and their importance in fostering entrepreneurial behaviour and success.

Furthermore, Ebersberger, Herstad, Iversen, Kirner, and Som (2011) categorized entrepreneurial skills into three main areas: personal characteristics, interpersonal skills, and critical and creative thinking skills. Personal characteristics involve examining an individual's attributes, values, and beliefs. It includes having a vision to identify areas for improvement and the ability to grasp the big picture and effectively communicate it to others. Kelley, Bosma, and Amorós (2010) found that creating a compelling vision of the future and inspiring others are key personal characteristics that instinctively drive problem-solving and business improvement projects.

In terms of interpersonal skills, the ability to build strong relationships with individuals who possess greater knowledge and experience is crucial. Mentorship plays an essential role in this stage, and entrepreneurs need to possess the skills to work effectively with their mentors. Gibb (2010) also emphasizes the importance of communication skills, including active and empathetic listening, building personal relationships, and negotiation. These skills are critical, as they can either make or break an entrepreneur. Lastly, critical and creative thinking skills are necessary for generating fresh ideas and making informed decisions about opportunities and potential projects. Skilled entrepreneurs are adept at problem-solving, setting goals, planning, and recognizing opportunities. They employ cause-and-effect analysis to develop sound solutions to problems and create plans to leverage identified opportunities. Overall, the combination of personal characteristics, interpersonal skills, and critical and creative thinking skills is vital for entrepreneurs to effectively navigate the entrepreneurial journey and maximize their chances of success.

Finally, in accordance with Chang and Rieple (2013), the UK's higher education standards, NCGE, which is the National Council for Graduate Entrepreneurship (Hannon 2006; Herrmann et al., 2008), BuSAACSB's Biz/Ed, and ONENET in the USA (Purao & Suen, 2010), also defined entrepreneurial skills as four categories and seventeen skills. In this study, these seventeen skills were mainly going to be utilized for analysing

students' and teachers' diaries as a criterion for the development of entrepreneurial skills. Table 8 shows the four categories and seventeen subsets of skills.

*Table 8. Entrepreneurial skills defined from UK's higher education standards NCGE and USA's BuSAACSB's Biz/Ed and ONENET (Chang & Rieple, 2010)*

<b>Entrepreneurial skills</b>	<b>Detailed entrepreneurial skills</b>
<b>Technical skills</b>	<ul style="list-style-type: none"> <li>- Managing operations skills</li> <li>- Managing supplies and the supply chain skills</li> <li>- Office/production space skills</li> <li>- Managing plant and equipment, technology and production processes skills</li> </ul>
<b>Management skills</b>	<ul style="list-style-type: none"> <li>- Planning and organizing</li> <li>- Marketing skill</li> <li>- Financial management skill</li> <li>- Legal skills</li> <li>- Administrative skills</li> <li>- Higher-order skills</li> </ul>
<b>Entrepreneurship skills</b>	<ul style="list-style-type: none"> <li>- Business concept</li> <li>- Environmental scanning</li> <li>- Opportunity recognition</li> <li>- Advisory board and networking</li> </ul>
<b>Personal maturity skills</b>	<ul style="list-style-type: none"> <li>- Self-awareness</li> <li>- Accountability</li> <li>- Emotional coping</li> <li>- Creativity</li> </ul>

Several studies have highlighted the importance of technical skills for successful entrepreneurs, particularly in the realm of managing operations. Research by Brush et al. (2001), Lichtenstein and Lyons (1996), Tyebjee and Bruno (1984), Saxenian (2002), and Smith, Henry, and Munro (2002) indicates that entrepreneurs with expertise in managing operations beyond basic production have a higher likelihood of success. Skills related to managing supplies and the supply chain are crucial for entrepreneurs. These skills involve the ability to source and procure necessary supplies and effectively manage the flow of materials and resources. Studies by Arend and Wisner (2005), Gonzalez-Padron, Hult, and Calantone (2008), Handfield, Petersen, Cousins, and Lawson (2009) highlight the importance of these skills in entrepreneurial success.

Additionally, having proficiency in office and production space management is essential. Entrepreneurs need to understand how to align their product or service needs with the availability of suitable office or



production spaces. Keeping up with new technologies and possessing technical skills are also vital for entrepreneurs. Being knowledgeable about emerging technologies (Shane, 2000; Sukanya, 2008) and acquiring technical skills (Lichtenstein and Lyons, 1996) enable entrepreneurs to effectively manage plant and equipment, technology, and production processes. Overall, technical skills related to operations management, supply chain management, office and production space management, and familiarity with new technologies play a significant role in the success of entrepreneurs. These skills enable entrepreneurs to navigate the complexities of running a business and remain competitive in their respective industries.

Lyons and Lyons (2002) identified six distinct management skills. The first skill is planning and organizing, which encompasses supervisory and directive abilities as well as proficiency in planning and organizing tasks (Oakey, 2003; Smith, Schallenkamp, & Eichholz, 2007). The second skill is marketing, which involves the identification of target customers, distribution channels, and supply chains (Tyebjee & Bruno, 1984; Morris, Schindehutte, & LaForge, 2002). The third skill is financial management, which includes budgeting, sourcing and managing financial resources, and effectively handling and minimizing risks (Burns, 2008; Timmons & Spinelli, 2009). The fourth skill is legal competence, which encompasses the ability to handle legal documentation, manage risks, and address privacy and security concerns. The fifth skill is administrative proficiency, which involves the alignment of organizational structure and strategy as well as the effective handling of advisory board relationships and interpersonal interactions (Baron & Markman, 2000). Finally, the sixth skill comprises higher-order abilities such as learning, problem-solving, and the capability to develop core competencies and capabilities (Brush et al., 2001; Haberberg & Rieple, 2008).

Entrepreneurship skills encompass various aspects. Firstly, there is the skill of developing a business concept, which involves transforming an idea into a well-structured business plan (Clark, 2008; Chen, Yao & Katha, 2009). Secondly, environmental scanning is an essential skill that enables entrepreneurs to identify gaps in the market (Corbett, 2005). Thirdly, opportunity recognition is crucial, as it involves identifying and capitalizing on market opportunities (Galloway, Anderson, Brown & Wilson, 2005; Seet & Seet, 2006; Baron & Ensley, 2006). Finally, there is the skill of effectively managing advisory boards and networking, which requires striking a balance between independence and seeking assistance (Baron & Ensley, 2006).

Personal maturity skills encompass various important aspects. Firstly, self-awareness is a critical skill that involves reflecting on past experiences, recognizing weaknesses, and actively working towards improvement (Kutzhanova, Lyons & Kichtenstein, 2009; Collins, Smith & Hannon, 2006; Richardson & Hynes, 2008). Secondly, accountability is essential, as it requires individuals to take personal responsibility for resolving problems and addressing challenges as they arise (Smith et al., 2007). Thirdly, emotional coping skills are valuable, as they involve understanding and effectively managing one's own emotions and those of others, using emotions to enhance cognitive processes (Mayer & Caruso, 2002; Goleman, 1995).

Lastly, creativity is a key skill in entrepreneurship, as it involves generating new ideas and innovative solutions (Galloway et al., 2005; Shane, 2000; Smith et al., 2007).

Thus, in this thesis, the four entrepreneurial skills defined by the UK's higher education standards, NCGE, and the USA's BuSAACSB's Biz/Ed and ONENET were utilized for analysing the data (Chang & Rieple, 2010). While this study did not rely on quantitative research methods, an important criterion was established for analysing students' diaries. This criterion is crucial in demonstrating the impacts of entrepreneurship education based on design thinking.

### **3 PURPOSE AND OBJECTIVES**

#### **3.1 Purpose of the thesis and learning objectives**

This study is based on qualitative research methodology. According to Bhandari (2022), qualitative research involves the collection and analysis of non-numerical data such as text, video, or audio in order to gain an understanding of concepts, experiences, opinions, and other subjective aspects. It is a method used to obtain in-depth insights into a problem or generate new ideas for research. In this thesis, diaries were collected and analysed to gain further insights into the subject matter.

Salazar (2016) explains that a diary study is a research method that involves collecting qualitative data about specific experiences, behaviours, and activities over time. In a diary study, participants self-report their data longitudinally. In this thesis, a diary study approach was utilized, where both the researcher (the teacher) and the participants kept diaries to record information about their experiences and the projects studied during the course. The researcher maintained a diary to describe the process and their own learning as researchers, while the participants were also asked to keep diaries and record relevant information about the projects. The teacher provided dedicated time for participants to write in their diaries after each step of the course to ensure regular documentation. The diaries of both the researcher and the participants were used as valuable research materials to describe the process and the lessons learned throughout the course..

Diary studies differ from other common user research methods in terms of the context and duration of data collection. Unlike usability tests, which typically generate observational data from specific moments or planned interactions in a controlled laboratory environment, and surveys, which gather self-reported information about participants' habits and experiences outside the context of the scenarios being studied, diary studies capture data over an extended period of time and within the natural context of participants' lives. Usability tests and surveys can be considered "poor man's field studies" in the sense that they provide insights that are not as detailed or abundant as those obtained from a true field study. However, they can still offer valuable information and serve as a reasonable approximation of real-life experiences. In contrast, diary studies allow for more in-depth and nuanced observations of participants' experiences, behaviours, and activities as they unfold over time, providing a richer understanding of the subject matter under investigation.

The primary focus of this thesis is to investigate the impact of entrepreneurship education based on design thinking on Korean vocational high school students. The 'Introduction to Entrepreneurship' course outlined in the national curriculum for primary and secondary schools in Korea aims to equip students with the

necessary knowledge and attitude to engage in entrepreneurial activities and start-ups (Ministry of Education, 2015). However, existing entrepreneurship textbooks in Korea predominantly focus on practical knowledge related to starting a business.

According to Neck and Greene (2011), entrepreneurship education should shift its emphasis towards preparing students to take action, make predictions, and create in an uncertain future. One potential approach to achieving this is by incorporating design thinking principles into the school curriculum (Nielsen & Stovang, 2015). Rather than solely focusing on the establishment of new businesses, the goal of entrepreneurship education should be to foster entrepreneurial attitudes and abilities among students (Fayolle et al., 2006).

Therefore, the aim of this thesis is to explore how entrepreneurship education based on design thinking can contribute to the development of entrepreneurial skills in Korean vocational high school students. By adopting a design thinking approach, students can learn to think creatively, solve problems, and adapt to changing circumstances, which are essential skills for future entrepreneurial endeavors. To sum up, the learning objectives in the thesis process are as follows:

- To apply the concept of entrepreneurship education based on design thinking to the real lesson
- To discover the effects of development of the entrepreneurial skills after a design thinking course
- To collect the various views of vocational high school students about entrepreneurship education based on design thinking

### **3.2 Data collection process**

The diary study is chosen as the primary method for data collection in this thesis due to its numerous advantages. Diary studies are known for their high ecological value, as they allow data to be collected in the natural environment of the participants (Czerwinski, Horvitz & Wilhite, 2004). This enables researchers to gain insights into participants' habits, behaviours, and situational decisions over time (Elsweiler, Mandl & Kirkegaard Lunn, 2010). The diary study encourages participants to reflect on various aspects of their environment as events unfold, bringing subtle observations to light.

One of the key strengths of diary methods is their flexibility and potential to yield rich qualitative data (Bolger, Davis & Rafaeli, 2003). Unlike methods that rely on retrospection, diaries provide real-time accounts, ensuring that experiences and events are sequentially ordered and reducing the likelihood of forgetting important details (Milligan, Bingley & Catrell, 2005). Furthermore, diaries offer participants the freedom to elaborate on matters that are personally salient to them, as there is no researcher present during the

recording of data. This can be particularly beneficial when studying intimate behaviours or personal experiences (Breakwell, 2012). By utilizing diary methods, this thesis aims to capture the nuanced experiences and reflections of both the researcher (through their own diary) and the participating students. This approach allows for in-depth exploration of the impacts of entrepreneurship education based on design thinking within the natural context of the students' daily lives.

In this diary-based thesis, there are two type of diaries.

- Students' diary
- Teacher's diary

In regard to students diaries, students wrote their diaries on the private spreadsheet in Google Classroom. They wrote their diary after they completed each step of the design thinking process. The teacher informed students in advance that the diary would be kept confidential. The student diary reflected 20% of the performance evaluation. This evaluation did not consider the quality of the content, but if it was written with sincerity or not.

As can be seen in Appendix2, student diary consists of eight questions.

- What do you think the objectives of today's lesson are?
- What are you trying to achieve with each one of them?
- How did you feel after today's lesson? Why did you feel like that?
- What did you find difficult in today's lesson?
- What did you do to overcome these difficulties?
- Have you developed any skills in today's lesson? If so, please describe them.
- Would you like to develop any skills more? If so, please describe them.
- Feel free to add anything about the session that you haven't mentioned at this point.

In order to listen to students' opinions as much as possible, these 8 questions were decided upon as a data collection tool. I created these 8 questions to find out what kinds of thinking students had and felt after they finished each step. In particular, I wanted students to remember the objectives by asking the first question. And I was curious about what they tried to achieve at this stage in the second question. For a more comfortable atmosphere, I asked their feelings in the third question and then asked their difficulties. The reason why I asked about their difficulties and how to overcome them was that I thought that they could grow up through the hardship. After that, I asked what skills students were developing directly. This question could be my main question for my data collection. Finally, I also had a question about their wishes, which students wanted to develop. Overall, the focus I intended to have was on finding out what skills the students improved through each step. After students completed each stage of design thinking, I picked up the diaries. On average, students took about twenty minutes to fill in their diaries.

As can be seen from my lesson plan (Appendix 1), my design thinking process consisted of five steps: empathize, define, ideate, prototype, and test. Therefore, one student wrote five diaries after she finished the course. Each step took one week on average, so it meant that this student diary was based on a weekly diary. In addition, I asked my students to write one more diary after they completed the whole design thinking course. As a result, the total number of diaries that each student wrote down was six. It meant that I collected diaries from 54 students, so I gathered 324 diaries. However, the number of diaries that students submitted varied from week to week. Some students who had been infected with COVID-19 were absent for a week because they were banned from going to school, so they could not participate in my lesson. Furthermore, a handful of students were absent without any reason or did not write down diaries, even though I encouraged them to fill them in. Thus, the total number of student diaries was 298.

The data collection period in 2022 was from the 14th of March to the 6th of May. During that period, there was some break time because of mid-term test week, a school trip, and so on, so it took more than 7 weeks overall. After I collected the diaries, I picked up all the ones that had rich contents and then analysed them using thematic analysis methodology.

To be honest, I was supposed to interview several students for additional data collection, so I invited a few interviewees and did the interview. However, I could not get a supplemental date from them. There were a couple of reasons. First, this interview was done after they finished the whole course, so they already wrote down their diaries, and there were no more comments about it. Second, students in my school tended to express their opinions timidly, even though I provided a comfortable atmosphere. Moreover, I guessed that students usually preferred writing because they were already accustomed to communicating with others in an emergency situation after the pandemic.

Secondly, I wrote diaries as a teacher. It meant that I was the provider who gave me the data myself. I wrote lesson diaries as a reflection after every lesson during the seven weeks except the first week. It meant that I wrote six diaries, and it could be a weekly diary like a student diary. For the teacher's sake, I took notes during the lesson. It included everything, such as feelings, observations, and thinking about students and lessons. In addition, the teacher could also write about the overall class atmosphere in the teacher diary. The data collection period was the same as the student diary's data collection duration. After that, I analysed the teacher's diaries and compared the students diaries. The teacher's diary form can be found in Appendix 3.

### **3.3 Data analysis process**

In this thesis, after collecting the students' diaries at the end of each step of the course, I conducted an analysis of the diaries to draw conclusions. The analysis of the diaries was performed using thematic analysis, which involves searching for repeated patterns of meaning across the data sets (Braun & Clarke, 2006). Thematic analysis involves a systematic review and coding of the diaries and transcribed interviews. Coding refers to the process of assigning labels to words or phrases to identify the topics or themes that the data refers to. This process helps in organize the data in a way that is useful for further analysis (Bailey & Bailey, 2017). By coding the diaries, I was able to identify and extract key themes or patterns that emerged from the students' reflections and experiences throughout the course.

The thematic analysis allowed for a comprehensive exploration of the data, enabling a deeper understanding of the impacts of entrepreneurship education based on design thinking on the development of entrepreneurial skills among Korean vocational high school students. The whole process was structured according to the six phases explained by Braun & Clarke (2006), which are:

- Step 1: Familiarizing with the data (translation and transcription)
- Step 2: Generating initial codes
- Step 3: Searching for themes
- Step 4: Reviewing themes
- Step 5: Defining and naming themes
- Step 6: Producing the report of analysis

All of the processes for writing diaries were conducted in Korean, and then I translated Korean to English for coding.

#### **A) Familiarizing with the data**

At first, I collected all student diaries in Google Classroom, which are written in Excel form and translated from Korean to English for coding, and read and re-read the contents of the student diaries, highlighting the relevant responses. After that, I noted down my initial idea. For more understanding, I extracted one student diary from the first step as a sample:

##### **Student diary (original version written in Korean)**

의사소통 능력이 가장 향상 되었다고 생각하고 그만큼 협동심도 향상된 것 같다고 생각한다. 아무래도 조별로 활동을 하다 보니, 다른 어떠한 활동보다 조별 친구들과 마주하고 얘기하는 시간이 많아지기 때문에 말을 하고 싶지 않아도 말을 많이 하게 되어

의사소통 능력이 향상되었고, 나 혼자가 아닌 다른 사람들과 함께 활동을 진행하기 때문에 서로 힘을 합하여 문제를 해결해 나가기 때문에 협동심이 향상되었다고 생각한다.

Student diary (English translated version)

I think that communication skills have improved the most, and I think that the sense of cooperation has improved as well. Since I work in groups, I spend more time talking with my friends in groups than in any other activity, so I can talk a lot even if I don't want to talk, so my communication skills have improved, and I am working with people other than myself. Because of this, I think that teamwork has improved because we work together to solve problems.

Note (Data extract)

- Communication skills have improved the most.
- Cooperation has improved as well, I work in groups.
- I can talk a lot even if I don't want to talk, so my communication skills have improved.
- Teamwork has improved because we work together to solve problems.

## B) Generating initial codes

After familiarizing myself with the data, I produced the initial codes from interesting features of the data in a systematic section across the entire data and collated the data relevant to each code. A code could be understood as a label that contained both a literal and conceptual understanding of the corresponding section of data (Clarke & Braun, 2013). I used the above sample to explain my process. This process was carried out for all the transcribed diaries, generating a total of 424 codes.

Table 9. Generating initial codes

Data extract	Coded for
Communication skills have improved the most.	communication
Cooperation has improved as well, I work in group.	cooperation
I can talk a lot even if I don't want to talk, so my communication skills have improved.	talk a lot
Teamwork has improved because we work together to solve problems.	teamwork

## C) Searching for themes



This step began with collating codes into potential themes. After that, I collected all the data relevant to each potential theme. For facilitating the potential themes (Chang & Rieple, 2013), I referred to the UK's higher education standards, NCGE, which is the National Council for Graduate Entrepreneurship (Hannon 2006; Herrmann et al., 2008), and BuSAACSB's Biz/Ed and ONENET in the USA (Purao & Suen, 2010). In this process, I grouped these initial codes into eighteen potential coding themes, and some of them were from the UK's higher education standards, NCGE, BuSAACSB's Biz/Ed, and ONENET. Figure 2 shows the 18 potential coding themes.

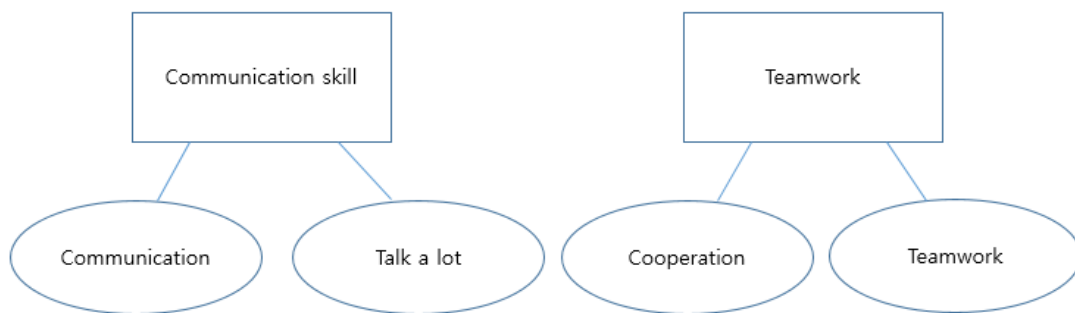


Figure 1. Searching for themes



Figure 2. 18 themes and the theme map

#### D) Reviewing themes

After I found eighteen potential coding themes, I confirmed if the themes worked in relation to the coded extracts and the entire data set and generated a thematic map of the analysis.



Figure 3. Reviewing themes

#### E) Defining and naming themes

To refine the specifics of each theme, I analysed them again and again. After that, I defined the overall story the analysis had told and generated clear definitions and names for each theme. In the end, I created five main themes from the potential coding themes: Management skills, Entrepreneurship skills, Personal maturity skills, Interpersonal skills, and Literacy skills.

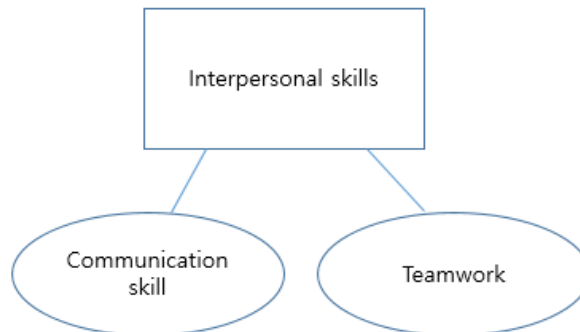


Figure 4. Defining and naming themes

In addition, I added two more themes. Firstly, interpersonal skills were supplemented with the ability to communicate and interact with other people effectively. I categorized empathy ability, communication skills, teamwork, leadership, followership, listening, and presentation skills into interpersonal skills. Secondly, when it comes to writing skills, information search skills, and computer literacy skills, I called these skills as literacy skills, which are the ability to read, write, speak, listen, and utilize tools in a way that lets us make sense of the world. Figures 5 and 6 show the contents of interpersonal and literacy skills.

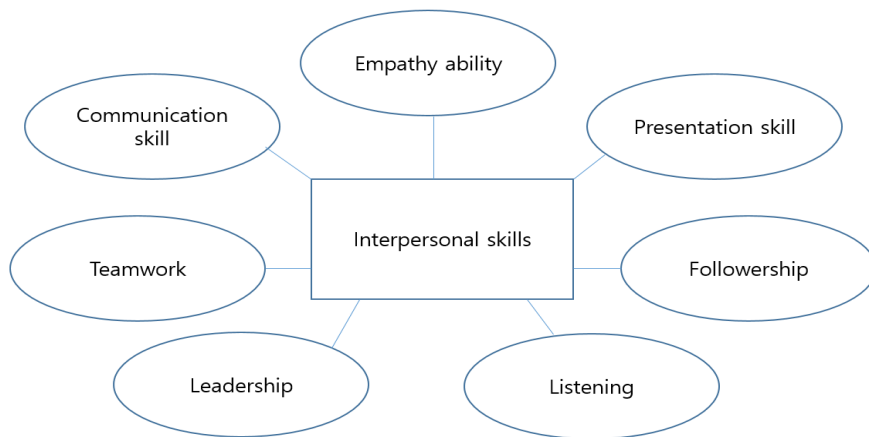


Figure 5. Interpersonal skills

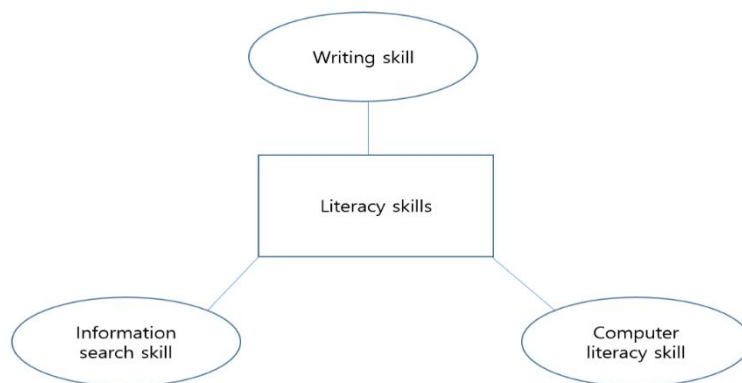


Figure 6. Literacy skills

## F) Producing the report of analysis

As a final phase for analysis, I had a set of fully worked-out themes relating to the literature by Chang and Rieple (2013), which was from the UK's higher education standards NCGE (Hannon 2006; Herrmann et al., 2008), BuSAACSB's Biz/Ed, and ONENET (Purao & Suen, 2010), and produced the last report of the analysis. In particular, when I analysed student diaries, I mainly focused on the question of which skills had been developed in today's lesson. The reason why I analysed the answer to that question was that I wanted to know what skills vocational high school students thought they had improved through the design thinking course. In addition, I could compare the results of the data from the student diaries with the teacher's diary and document the iterations in progress.

## 4 DESCRIPTION OF WORK TASKS AND LEARNING AS DIARY ENTRIES

This project was part of the 'Introduction to Entrepreneurship' course, and the design thinking project was mainly based on the Bootcamp manual by Stanford's Design School (2009). The following diary entries were explored from both the student and teacher perspectives about the entrepreneurship education based on design thinking project. As described in the previous section, these diaries followed a linear chronological order and were implemented over seven weeks with fifty-four students at Jeju Girls Commercial High School in 2022.

### 4.1 Planning the course

As the first step in planning this design thinking course, I read a number of articles and previous investigations about my topic and what other researchers have found out in their research. As a result, I found key theoretical concepts and reference materials. After that, I decided on my research question, research type, and analysis methods. And then I tried to outline the stakeholders who were related to my thesis, which were schools, students, and teachers. As a result, I decided to document the iterations done in the process involving students and teachers and planned to write teacher diaries by myself and ask my students to write diaries that reflected their learning.

As regards designing lessons, as can be seen in the previous section, it was the first time I taught this subject regularly at my school, so I needed enough time to organize and design my curriculum. I had looked for several books that contained entrepreneurship education and design thinking and finally found a reference book, *Passez au design thinking* (Aldana, Dromer, & Leméni, 2019), which was published in France. This book introduced some guidelines about teaching design thinking as a facilitator and suggested a lot of teaching and learning methods. All of the contents were based on the manual by Stanford's Design School (2010), which presented the design process as consisting of five steps: Empathize, Define, Ideate, Prototype, and Test. Referring to this literature, I planned my seven-week design thinking course.

The lesson plan is a teacher's road map of what students need to learn and how it will be done effectively during the lesson. According to the Singapore Management University Centre for Teaching Excellence (2023), there are three steps for designing the lesson, and I followed these steps. Before the lesson, the learning objectives of design thinking were identified in the entrepreneurship education course. After that, specific learning activities, assessments, and the sequence of the lesson were designed in February 2022. In particular, I tried to read various lesson plans from other teachers as well as case studies that were related to entrepreneurship education, and I had a rehearsal to practice teaching before the lesson.

Before implementing the lesson plans, I introduce them to my entrepreneurship class in short.

- Subject: Introduction to Entrepreneurship
- Semester: Spring semester (from March 1 to July 16, 2022)
- Teacher: Kwangkyu Lee
- Student: Senior (Office Management Major)
- The number of classes: 3 classes
- Capacity: Total 54 students (Class A: 24 persons; Class B: 24 persons; Class C: 6 persons)
- Unit: 3 units (3 hours per week for 17 weeks).
- Feature: Elective subject in specialized subject II (Students already applied for this subject last year)

With the basic information about the class, Appendix 1 shows lesson plans for the intensive design thinking course in the Introduction to Entrepreneurship class for seven weeks, and these were designed by myself. The first lesson plan is for a preparation stage, so it introduces the general course and team-building as an icebreaker. From the second lesson plan to the sixth, those are prepared according to the five stages of design thinking. The last lesson plan is described as a presentation and a reflection for students to finish the whole course.

As regards the assessment plan for this course, I discovered shifting focus to the process instead of the output in grade evaluation these days and accepted the idea that an effective way to capture the learning process has been through a writing reflection log (Musu-Gillette et al., 2016). As a result, this course mainly evaluated performance assessment, which meant that the teacher evaluated the process of design thinking rather than outcomes. In particular, this student diary accounted for 20% of the performance evaluation as a student process folio this semester. Table 10 shows the assessment plan for this course.

*Table 10. Assessment plan for Introduction to Entrepreneurship course*

Assessment Type	Paper based	Performance		
	Method	Multiple test	Design thinking project	Report
Rate				
	30%	Student diary	Process	20%
	20%			30%
Achievement Standard	[11-1] The meaning of design thinking can be explained. [11-2] The characteristics of design thinking can be explained. [11-3] The five-step process of design thinking can be listed. [11-4] The double diamond model can be explained. [12-1] The empathy stage of design thinking can be explained. [12-2] A stakeholder map can be created. [12-3] Users' needs can be identified through user interviews. [13-1] The problem definition stage of design thinking can be explained			

	[13-2] The customer persona and customer journey map can be created. [13-3] An empathy map can be created. [13-4] The problem can be defined. [14-1] The stage of deriving ideas in design thinking can be explained [14-2] The ideas can be derived through brainstorming, round robin, and SCAMPER. [15-1] The prototyping stage of design thinking can be explained [15-2] Prototypes suitable for product and service characteristics can be made. [16-1] The experimentation stage of design thinking can be explained. [16-2] The feedback on the prototype through user interviews can be received. [16-3] The final product can be completed by reflecting the feedback.			
<b>Detailed Assessment Standard</b>	- Design thinking - Case study about start-ups	- How many times students submitted the student diary with all answers of questions in good faith within the deadline?	- Did you draw a stakeholder map? - Did you describe interview questionnaire? - Did you draw customer persona and customer journey map? - Did you draw an empathy map? - Did you define the problem statement? - Did you do brainstorming? - Did you write Round-robin? - Did you write SCAMPER? - Did you produce a prototype? - Did you interview for feedback of prototype? - Did you complete your final product or service? - Did you have a presentation?	This report is a case study about successful start-ups. It is the second project after student finish design thinking project.

## 4.2 Implementing the course

### 4.2.1 Week 1: Introduction to design thinking

Prior to the design thinking project, I provided a brief introduction of myself and the course curriculum to the students. As an ice-breaking activity, I instructed the students to draw their own persona. This activity was chosen because students often feel more confident when drawing something unfamiliar, and it encourages them to share their drawings (Lanius, Weber, Spiegle, Robinson & Pott, 2020). Additionally, this activity aimed to help students identify their own strengths and weaknesses and appreciate the differences among their peers. The teacher diary in Appendix3 indicates that students appeared to enjoy creating their personas. However, during the informal presentations, which lasted around a minute, many students exhibited some shyness and hesitancy.

The marshmallow challenge (Wujec, 2013), which is a collaborative design game, was introduced to the students. This activity aimed to provide a hands-on experience of teamwork dynamics and stimulate brainstorming sessions. The students thoroughly enjoyed this activity. In previous classes, some students would often become disengaged, even falling asleep. However, during the marshmallow challenge, I observed that all students actively participated, and there were no instances of students dozing off or becoming distracted. Additionally, the objective of this activity was to emphasize the significance of teamwork. Typically, each team consisted of around five students, with some flexibility for slight variations in team size upon mutual agreement. After the marshmallow game, we took the opportunity to reflect on our experiences, and some students shared their thoughts and feelings about the activity.

“Our team member is only 4 students, so I feel about the shortage of team members.”  
(Student 1)

“The total number of our team members is six, so it is hard to adjust different opinions over time.” (Student 2)

It seemed that students felt how important not only teamwork was but also that the team members were crucial throughout the marshmallow game. After that, I introduced the definition of design thinking and the entire course in brief. However, students did not seem to understand the concept of design thinking because they had never heard of the terminology before. The excerpt about this issue from the student diary is as follows:

“It is hard to understand what design thinking is, and it looks difficult for me. Furthermore, I worry about the team project because I prefer working alone rather than as a team.”  
(Student 3)

To solve this problem, I tried to speak slowly and explain the core concept repeatedly next class. Since this class just introduced the concept of design thinking, I tried to reassure the students that it was okay if they did not understand everything today. Furthermore, I emphasized to the students that teamwork was the most important part of this project. Since students often work as a team in college or in the future, it would be good to work as a team for practice.

To achieve the objectives of the lesson, I also instructed the students to assign duties. There were four kinds of roles: coach, secretary, time-boxer, and decision-maker. The coach usually held a meeting, and the secretary played the role of taking notes about making decisions. Managing schedules and keeping timing was a role of the time-boxer. The decision-maker made sure everyone could agree on the decisions and communicate with others. If the number of team members was over 4, it was allowed to have double

positions on one team. This following excerpt from the teacher diary comprehensively shows what kinds of perspectives were seen during the first week:

“It is the first time I have taught design thinking in the regular class, so I was also a little bit nervous and worried about my class. I didn’t use an official textbook, so I have to organize everything, such as the curriculum, syllabus, lecture material, evaluation plan, and so on. It is not easy to do this at first. However, it was a worthwhile process because all students actively participated in my lesson.”

#### **4.2.2 Week 2: Empathize**

During the second week of the course, we began the first step of the design thinking project. To facilitate the course, I utilized an online collaborative platform called 'Mural.' This platform served as a shared workspace and an educational tool, enabling effective collaboration among participants. According to the introduction page of the Mural website (2023), their mission is to inspire and connect individuals engaged in creative work worldwide by providing teams with the necessary means, methods, and freedom to innovate from any location. I had previous experience using this platform during my Service Design course at Oulu University of Applied Sciences in 2021–2022, where I pursued a master's degree in Education Entrepreneurship. As both a facilitator and a teacher, I found Mural to be a suitable platform for my course, as it was specifically designed for collaborative work and provided me with a convenient overview of all the groups' activities during class.

Before entering the design thinking project, I informed my students of the subject of the whole frame in this project:

‘Developing a product or service that can address inequality in our society’

In fact, this topic was already determined when I planned the lesson in February. After that, I asked students to determine the specific inequality, such as sex inequality, regional inequality, digital inequality, and so on. For more understanding, I gave some examples of the discriminatory treatment by using newspaper articles or TV news in Korea. I thought that these examples were helpful for students to remind them of ideas and look for the detailed subject. After that, students had a discussion about their project subject and investigated further information by using articles, books, and so on. Finally, students decided on a detailed topic for each group. The topics chosen by the students were as follows: Gender inequality, Regional inequality, Disability



inequality, Education inequality, generational inequality, Digital inequality, Inequality in vocational high schools, etc..

Henriksen, Richardson, and Mehta (2017) emphasize that empathy is a crucial starting point in the human-centred approach of design thinking. During this step, designers engage in observing users and their behaviours, interacting with and interviewing them, and immersing themselves in understanding the users' perspectives and experiences. By gaining these insights, designers are equipped with a profound understanding of the users' needs and challenges, enabling them to approach the subsequent stages of the design thinking process with a strong foundation.

The goal of this week's program was to draw a stakeholder map and do an interview to empathize with the users. At first, I introduced the stakeholder map and explained how to draw it. After that, I asked students to draw their stakeholder map. In this activity, some students asked questions about the differences between direct and indirect stakeholders. To solve this, I explained the difference between direct and indirect stakeholders with examples and gave individual feedback to each team on the stakeholder map created by the students while touring the classrooms. The excerpt about this from the student diary is as follows:

"It is hard to distinguish between direct stakeholders and indirect stakeholders. I was very confused about it, so I asked this question to my teacher. After the feedback, I realized that there were many kinds of stakeholders, which I hadn't known at this time. In addition, some skills were improved this week when I looked for stakeholders. When I found the indirect stakeholders, I thought from various points of view. As a result, I thought that the ability to think convergently and divergently improved after this phase. Finally, it was a useful activity because I learned a lot about inequality in our society that I did not know." (Student 4)

After this activity, I asked students to do a user interview. For the user interview, it was mandatory to make a proper questionnaire for empathizing with the user's problems. Students discussed what kinds of questions they had. I suggested open-ended questions such as "What do you think~?", "How do you know~?" and "Why do you think~?" rather than close-ended questions. And then students decided who would be interviewed and how many people would be interviewed. I demanded to interview at least five interviewees, summarize their answers, and share them with team members. However, some students seemed to have some trouble looking for interviewees. In fact, it was impossible to look for appropriate interviewees at school because students were not allowed to go outside during the lesson. To solve this problem, I suggested making a call for the interview. In addition, I introduced certain interviewees to the group. For example, in the case of the disability inequality theme, I matched a handicapped person I had known before with students who wanted to interview the disabled. After this activity, I had an interview about today's activity, and one student said that:

“When I was asked to do an interview at first, I was at a loss as to how to do it and to whom. In particular, finding an interviewee was very difficult. However, the teacher told me how to conduct an interview and how to find an interviewee, so I was able to conduct the interview. Interviewing was nerve-wracking and difficult at first, but I gained confidence while doing the interview, and I think I gained the ability to empathize with this topic. It seems that the ability to speak coherently while asking questions about the interview contents has developed, as has the ability to listen to other people's thoughts. It was also fun to learn that each person has different thoughts on a single topic.” (Student 5)

After this activity, some teachers were interested in my lesson and asked me about the project because many students had selected school teachers as interviewees. Teachers who participated in the interview gave me feedback on what they had done with students, and most of the teachers seemed to enjoy the interview and expect the student's performance outputs after this project.

During the empathize phase, Henriksen et al. (2017) suggest that students are encouraged to question, acknowledge, and challenge their own assumptions, leading to surprises and new perspectives as a problem-solving strategy. This process not only helps students develop communication skills but also enhances higher-order thinking skills and environmental scanning skills. The teacher's diary excerpt regarding this phase is as follows:

“Overall, students seem to develop their communication skills because every activity is done as a team. When they draw stakeholder maps, I think they develop higher-order thinking skills because they should think about direct and indirect stakeholders. In addition, students seem to develop environmental scanning when they are looking for their topic. Students were trying to track the trends and occurrences in their internal and external environments with their topic.”

#### **4.2.3 Week 3: Define**

In the define step, students utilize the insights gathered during the empathize phase to focus on the problem at hand. The goal is to move beyond a simple definition and instead delve into the complexities of the user, the problem, and the context. Designers articulate a problem statement based on the details and understandings they have gained, using tools such as customer personas, empathy maps, or journey maps. By narrowing down and framing the problem, they provide guidance for subsequent design efforts (Henriksen et al., 2017).

The objective of the define phase is to create a customer persona, empathy map, or journey map in order to define the problem. This process allows students to view the problem from multiple perspectives, emphasizing the importance of thoroughly considering and framing the problem. This approach leads to a deeper understanding of the context and provides a basis for moving forward effectively.

During the definition stage, I guided students to create a customer persona and develop a journey map, or empathy map. According to Tschimmel (2012), personas are fictional characters that represent a group of users, helping to make abstract user profiles more tangible. Based on insights gathered from observational activities, personas highlight specific attributes of the users of a product or service. They are not meant to represent a specific target group but rather to provide deeper insights into the various experiences users have. The goal is to stimulate the generation of ideas for improving those experiences (Liedtka & Ogilvie, 2011). Many students found enjoyment in creating customer personas, using their creativity to craft virtual characters with names, professions, ages, and personality traits similar to main characters in movies.

In terms of the customer journey map, which illustrates the stages customers go through when interacting with a product, service, or problem (Rosenbaum, Otolara & Ramírez, 2017), some students encountered difficulties in creating accurate maps. For example, they included irrelevant activities or failed to capture relevant feelings and needs related to their topic. To address this issue, I provided detailed explanations and examples to guide them in properly constructing the maps.

As can be seen from the previous phase, my students seemed to like examples when they learned new content. There were pros and cons to teachers giving examples for students to solve problems. At first, I was hesitant about giving examples to students as it might restrict their creativity. On the other hand, if examples are not given, students might not be able to solve the problem correctly. In my case, I gave a couple of examples of dissimilar kinds of inequality, but those cases were related to inequality. After the feedback, students completed their customer journey map. I expected students to develop their creativity by this stage, but I found that several journey maps were quite simple. One of the reasons they created an uncomplicated map could be their lack of ability to share opinions. The excerpt about this from the teacher's diary is as follows:

“When students drew the customer journey map, the flow of customers was quite simple. I think they are still high school students, so they don't have a lot of experience with those problems. In particular, I think vocational high school students lack confidence compared to general high school students. Some students tend to be afraid to express their opinions

to other students. I am sure these characteristics are not only for vocational high school students.”

The empathy map serves as a visual tool to organize information gathered from personas, observations, and interviews. Its purpose is to provide a visual representation that encourages reflection and discussion from the user's perspective, including their influences, needs, emotions, desires, and fears within the context of the project (Tschimmel, 2012). When students worked on creating empathy maps, they found it relatively easy compared to the journey map. This could be attributed to the fact that the empathy map consists of clear sections: What customers think and feel, hear, see, say, and do; gains; and pains. These sections provided a clear framework for students to describe and analyse the user's experience. Through this activity, I observed in the student diaries that their empathy skills were developing.

“Through the empathy map, I think my empathy ability has improved. I had to understand and empathize with the users. This activity is not from my point of view but from the position of the other person who was in trouble with the inequality situation, thinking about what feelings and thoughts they would have had.” (Student 6)

In the last work, students defined the problem statement. In this activity, I asked students to answer three questions:

- Who is the subject of the problem?
- What is the problem?
- What do they need?”

I expected students to find out the nature of the matter and summarize the activities so far so that they could be helpful for the next step, prototyping. Students also mentioned that they thought the way to organize problems had improved in their student diary.

#### **4.2.4 Week 4: Ideate**

According to Henriksen et al. (2017), ideation is a deliberate process of generating new ideas and serves as an opportunity to explore a wide range of possibilities without limitations. The main objectives of this stage are to decide on a product or service through the ideation process. In my class, I introduced three types of ideation tools: Brainstorming, Round-robin, and SCAMPER.

Brainstorming, as defined by the Cambridge dictionary, is an activity or method where a group of people gather to generate numerous new ideas for potential development. Tschimmel (2012) describes brainstorming as a participatory session focused on idea generation without discussing or fully developing the ideas. The goal is to produce a large quantity of ideas within a limited amount of time, emphasizing emotions and intuition over rational thinking. While many groups worked enthusiastically and successfully with brainstorming, I also acknowledged that some students were not comfortable with this traditional method. To address this, I introduced both brainstorming and brain-writing (VanGundy, 1984) simultaneously in my class. I believed this approach would overcome the limitations of traditional brainstorming. Overall, the combination of brainstorming and brain-writing was well received by the students, and they actively participated in generating ideas.

After the brainstorming and brain-writing activities, students selected several ideas to proceed with the next stage, which involved the round-robin activity. Round-robin allowed group members to generate ideas without being influenced by any one person. This process enabled students to expand their creativity and carry their ideas forward in the problem-solving process. Here are the six steps involved in using round robin (Mind Tools Content Team, 2023):

- Step 1: Gather your team together around a table. Give each person index cards so that they can record their ideas on individual pieces of paper.
- Step 2: Acting as a facilitator, explain the problem that you want to solve. Be specific about the objectives of the brainstorming session. Answer questions, but discourage discussion. The goal of this step is to allow individuals to think creatively without any influence from others.
- Step 3: Have each team member, in silence, think of one idea and write it down on an index card.
- Step 4: Once everyone has written down an idea, have each person pass their idea to the person next to them. Everyone should now be holding a new card with their neighbour's idea written on it.
- Step 5: Have each person use their neighbour's idea as inspiration to create another idea. Then ask each person to hand in their neighbour's card and pass their new idea to the person next to them to repeat step 4.
- Step 6: Continue this circular idea. swap for as long as is necessary to gather a good amount of ideas. When the time is up, gather up all the ideas. You can now collate them, eliminate any duplicates, and discuss them further as required.

I thought that both the teacher and students were not familiar with round-robin, but this was not difficult to do. Most groups seemed to expand their ideas quite well in round-robin order. As a result, many students mentioned in their diaries that their creativity had significantly improved through this activity. I also agreed with the student's opinion when I checked the student's outcomes from the round-robin. Although their ideas

were not very specific, they were enriched and developed into inventive ideas that could become actual prototypes.

However, students seemed to run into difficulties in doing SCAMPER, which was also a useful tool for generating ideas for new products or services. SCAMPER stands for Substitute, Combine, Adopt, Modify, Put to another use, eliminate, and Reverse the original ideas. SCAMPER is indeed a quick and effective method for creative brainstorming (Serrat & Serrat, 2017). On the contrary to its original intention for brainstorming, many students complained about this activity because it was not easy to apply all the elements of SCAMPER to their ideas. Although some students said that they learned how to think in a different way, most students did not yield significant results from the SCAMPER activity. Therefore, since there were sufficient tools for ideation, such as brainstorming and round-robin, I decided to omit SCAMPER at this stage next year. In the teacher's diary, the teacher recorded as follows:

“It was hard to explain SCAMPER. Their creativity toward their item is quite limited, so it was difficult to expand and think in a different way. Some students feel uncomfortable suggesting their ideas. To overcome this difficulty, I gave them some examples.”

At the ideation step, learners explored a wide variety of solutions and ideas. The goal was to go beyond the obvious to brainstorm, incubate, and generate far-ranging ideas, solutions, and approaches connected to the problem. I thought that the teacher needed to help students go wide with ideas, keeping the problem in mind but also letting flights of fancy bring up novel, creative ideas. In particular, I thought that this stage was one of the core steps for developing their communication skills, cooperative abilities, and creativity. The following excerpts about this issue from the student diary support that thought.

“I think teamwork has improved through this stage. Our team members became more active, and I was so grateful that they worked harder and did better. I realized the reason why we organize and work as a team. Of course, it was very difficult to ideate, but it will be more difficult to do alone.” (Student 7)

“At first, our team didn't take part in group activities enthusiastically because we didn't know how to communicate with each other and mediate between two parties. As time went by, our teamwork got better. I was able to discover my development in communication. I also became closer with my teammates, and we were one team in the end.” (Student 8)

“The ability to listen and speak seems to have improved. In order to be active, I had to concentrate on others opinions. In addition, I had to think and speak my opinion to share ideas, so I think my listening and speaking skills have improved.” (Student 9)

#### **4.2.5 Week 5: Prototype**

A prototype is an early version or representation of a product or service that is created to test and validate a concept or process (Blackwell & Manar, 2015). Prototypes can take various forms, ranging from physical models to diagrams, storyboards, or even improvised enactments. The primary purpose of a prototype is to make the idea tangible and enable learning through experimentation and iteration (Gonen, 2020).

During the prototype phase, students experience the excitement of bringing their ideas to life and transforming them into tangible realities (Henriksen et al., 2017). They understand the crucial connection between conceptual thinking and practical implementation. Prototyping encourages creativity by fostering a willingness to take risks and embrace the possibility of failure. It provides a safe space for students to explore and refine their ideas, gaining valuable insights and feedback in the process.

This week, I asked students to produce their samples. In the case of tangible products such as merchandise, it would be good to design a catalogue, poster, prototype sketch, and so on. If their prototypes were related to the service, a storyboard for an advertisement was enough for those groups. Finally, several teams chose a mobile application or a website as a prototype. In that case, it was a good way to introduce an UI app design or an UX web design as the prototype.

To facilitate the prototyping process, I introduced students to design tools such as Canva and MiriCanvas. Canva is an online graphic design tool that offers a wide range of templates for creating various visual materials such as social media posts, presentations, posters, videos, and logos (Canva, 2023). MiriCanvas, on the other hand, is a Korean company that provides visually-oriented design tools in Korean and offers a variety of templates and features for free (MiriCanvas, 2023).

In my class, the majority of students used MiriCanvas to create their prototypes, and the process was smooth and successful. I emphasized to students that the purpose of prototyping was not to achieve a final result but rather to explore and generate concrete ideas through trial and error. By utilizing these design tools, students were able to easily translate their ideas into visual representations, enabling them to learn and iterate upon their concepts effectively.

After the class, some students said:

“I realized that failing fast improves the ability to find quick solutions.” (Student 10)

“I was able to make a lot of imagination a reality because I made almost all the main UI design and opinions. It seems that the communication skills to express opinions accurately in words have improved.” (Student 11)

“I think my computer literacy seems to have improved.” (Student 12)

According to Glen et al. (2015), engaging in design thinking projects challenges students to actively apply and develop their knowledge. This active involvement not only enhances their confidence in tackling complex problems but also helps them cultivate perspectives that support these endeavours. Based on the analysis of the students' diaries, it was evident that they experienced growth in various areas, including problem-solving skills, communication skills, and computer literacy.

Most notably, many students expressed a significant boost in self-confidence and a sense of accomplishment during this phase. They were eager to share their prototypes with me and their classmates, indicating a strong desire to showcase their work. This finding aligns with the teacher diary excerpt, which reflects the students' enthusiasm and pride in their achievements.

“When the students finished their prototype, they were very pleased with it. I think many students gained a lot of self-confidence and a sense of accomplishment through this design thinking project. They seemed to want to show off their prototypes to other students. I think they have not had this kind of experience before, and this project doesn't evaluate knowledge, so they sincerely took part in the project. Other subjects in my school usually consist of lecture-based theory classes, but my lesson is a project-oriented practice class. I think vocational high school students prefer practice classes to theory classes. They seem to like learning by doing; this is the basic philosophy of vocational high school. Moreover, the entire project is done as a team. When I build a team, I instruct my students to voluntarily organize themselves into the desired team members. I think that's why they conduct this project actively. Many students said this project was a new experience and very hard work, but a worthwhile one. I've heard these comments many times.”

Even though this week was very meaningful, there was a problem for me as a facilitator. Some groups wanted to finish making their first products as soon as possible, so they made a rough product and took a rest after prototyping. I thought that it was a quite long-term project, and a few teams seemed to be tired of



doing activities as a group. On the other hand, some teams took a long time to complete their prototype. Those groups seemed to want to make a high-quality product or service at this stage. Therefore, it was difficult to manage time as a coordinator because each team had a different pace of prototype completion. To solve this issue, I asked students who had already finished prototyping to elaborate and add more features to their first sample. In the case of the slow team for the perfect prototype, it was emphasized that the prototype did not have to be perfect and that there were more opportunities to modify it after testing in the next step.

#### **4.2.6 Week 6 and 7: Test and Presentation**

Design testing plays a crucial role in the iterative and non-linear nature of the design process, as highlighted by Henriksen et al. (2017). Unlike field testing, design testing can be more productive and conducive to learning. It requires students to embrace their willingness to fail and view it as an opportunity for growth and improvement. During this testing phase, students had the opportunity to gather feedback on their prototypes by involving real or representative users and stakeholders. They conducted interviews, observed user interactions, or utilized other feedback-gathering methods to refine their prototypes. In cases where it was challenging to find real users, students interviewed their classmates or teachers as a substitute. Through testing, designers were able to gain new perspectives and insights, leading to further refinement or even a re-evaluation of the original design. This iterative nature of design was evident, as students had the flexibility to revisit previous phases such as empathizing with stakeholders or generating alternative solutions during the testing phase. Designers had the freedom to repeat or reconsider any of the earlier steps, highlighting the dynamic and adaptable nature of the design process.

For more understanding of the test, I explained why this testing was necessary for the original and how to get feedback. After that, I asked students to interview at least five people. However, many students seemed to have difficulty making questionnaires for the prototype test, so they often asked me what kind of questions to ask for the test. For this, I gave seven common questions for testing to the students, and they added more questions if they wanted. The common questions were as follows:

- What is your first impression of this prototype?
- Who do you think this prototype is for?
- What do you think this prototype is used for?
- When do you think this prototype will be used?
- Have you seen anything similar to this prototype?
- Is there something you don't understand after seeing this prototype?
- Please feel free to tell us what you see and feel about this prototype.

In this stage, I thought that students seemed to develop an ability to take an objective view of their product through the feedback. The excerpt about this from the student diary is as follows:

“I looked at my friends' products and services to find out whether they were good or not and what they lacked. I also got a lot of feedback from friends. As a result, I have been able to develop the ability to see and accept the feedback objectively.” (Student 13)

Whereas some teams were active in exchanging feedback, I found that some students tended to respond positively without giving any feedback. Also, students generally did not seem to want to make major changes to their first products after receiving feedback. Thus, I stressed the importance of feedback again and emphasized that no one produces finished products without modifying the original. After the feedback, I gave them enough time to revise their samples and finalize their products or services, and I preannounced the final presentation at the next lesson. I thought that the presentation was a good opportunity to summarize what they had been doing with their product. Students also agreed with the benefits of presentations. The excerpt about this from the student diary is as follows:

“At first, I was nervous and confused, but as I kept doing the presentation, I got used to it, and the trembling disappeared. I think my presentation skills have improved through this class. In particular, I tried to make it easy for others to understand my presentation.”  
(Student 14)

Although each group had a different attitude toward preparing for the presentation and the degree of completion was different, I thought that the presentation time was very meaningful for the students. After the presentation, I did not hesitate to praise and encourage students regardless of the outcome. All of us were satisfied with the entire seven-week project. I especially confirmed that students had been actively participating in the project as I had read students' diaries. In addition, I was able to grow up as a design thinking expert. In the last teacher diary, I described it as follows:

“The long-term project of seven weeks has finally come to an end. It was my first class, so I was inexperienced, and I had a lot of trial and error during the class. However, during the class, I was able to confirm that the students were actively participating in the class, and as I read the class diaries of the students, I felt that the students had grown more than before. At first, I thought a lot about whether or not to apply design thinking to regular start-up classes. However, I think it was the right decision to hold a design thinking class that can expand students' thinking abilities before learning the entrepreneurial knowledge in

existing textbooks. In particular, I could feel that the students' collaboration skills improved a lot through this class. Students found it difficult to share their opinions with their peers and did not communicate well. However, as the project progressed, I was able to see with my own eyes that communication between students became smoother and their ability to collaborate improved. As a vocational high school student who goes out into society after graduation, I think it is essential to develop collaboration skills. It was a meaningful time to feel, as a teacher, that design thinking is the best teaching tool for developing collaboration skills in various areas.”

## 5 CONCLUSION AND RELECTION

### 5.1 Conclusion

The main objective of this study was to investigate the impact of entrepreneurship education based on design thinking on the improvement of entrepreneurial skills among vocational high school students in Korea. Specifically, the study aimed to assess the development of entrepreneurial abilities, attitudes, and intentions after a seven-week intensive design thinking course. As highlighted by Fayolle et al. (2006), the primary emphasis of entrepreneurship education programs is not solely on the creation of new businesses but rather on fostering the development of entrepreneurial abilities and cultivating attitudes conducive to entrepreneurial behaviour. In line with this perspective, the project in question focused on nurturing entrepreneurial skills and attitudes, with design thinking serving as the main theme within the 'Introduction to Entrepreneurship' course. By integrating design thinking principles and methods into the curriculum, the study sought to provide students with a practical framework for problem-solving, innovation, and creative thinking. The aim was to equip students with the mindset and tools necessary for entrepreneurial endeavour, regardless of whether they eventually choose to start their own businesses or engage in entrepreneurial activities in existing organizations.

It is interesting to note the findings of previous studies that have examined the impact of design thinking on students' problem-solving abilities, creative thinking, and emotional intelligence. According to Lee and Yoon (2021), design thinking was found to be effective in enhancing students' creativity, specifically in divergent thinking abilities, adventure and curiosity, and intellectual inquiry. However, that study did not report significant improvements in original flexibility. While these findings provide valuable insights into the effects of design thinking on creativity, it is important to consider the specific context and variables involved. It is possible that the contradictory observation you made regarding the development of original flexibility through the testing process in your study suggests that individual students may experience varying levels of growth in different aspects of creativity.

Creativity is a multifaceted construct, encompassing various dimensions such as fluency, flexibility, originality, and elaboration. It is possible that design thinking interventions may have differential impacts on these different dimensions. Therefore, while Lee and Yoon's (2021) study did not find significant improvements in original flexibility, it is essential to consider the broader range of creative abilities and the potential variations among individuals. It would be valuable to further investigate and explore the specific aspects of creativity that are influenced by design thinking, as well as the factors that may contribute to

variations in the observed outcomes. This could help refine the design thinking approach and its implementation to enhance its effectiveness in fostering creativity and problem-solving abilities in students.

Moreover, I thought that teamwork was also a core ability for this project. Every process was done as a team, so a cooperative spirit was necessary for this project. Interestingly, I thought that an interpersonal skill, which could be a communication skill, was developed the most during the design thinking course. I found that students exchanged their opinions freely after the course. In the final dairy, the author also mentioned the importance of collaboration skills. From this, I found that teamwork could be a necessary skill for vocational high school students, and a design thinking course could be the proper methodology to develop cooperation.

The findings from Nabi et al. (2017) and the impact of the entrepreneurship academy you mentioned highlight the different effects that different approaches to entrepreneurship education can have on students' intentions to start a business venture. It appears that entrepreneurship courses focusing on developing various skills and competences, such as the design thinking course you conducted, have a positive influence on students' entrepreneurial intentions. These courses empower students, build their confidence, and provide them with the necessary skills and mindset to pursue entrepreneurial ventures. As a result, some students expressed a desire to start a business venture after completing the design thinking course.

On the other hand, the entrepreneurship academy, which was more academic in nature and focused on aspects like writing business plans and prospectuses, had a negative impact on students' plans to start a business venture. This aligns with the findings of Carrier (2005) and Von Graevenitz et al. (2010), who observed that basic entrepreneurship courses centred on business plans tend to discourage students from pursuing entrepreneurship. The contrasting outcomes suggest that the pedagogical approach and content of entrepreneurship courses play a significant role in shaping students' intentions and attitudes towards entrepreneurship. While courses focusing on developing skills and fostering an entrepreneurial mindset can inspire students to start their own ventures, courses that emphasize traditional business planning may not be as effective in encouraging entrepreneurial intentions. It is important for educators and policymakers to consider these findings when designing entrepreneurship education programs. Integrating skill development, experiential learning, and a human-centred approach, as seen in the design thinking course, can potentially foster entrepreneurial intentions and empower students to embark on entrepreneurial journeys.

Further research could explore the specific elements and teaching methods that contribute to the positive impact of skill-based entrepreneurship courses and investigate ways to integrate these approaches into broader entrepreneurship education initiatives.

Furthermore, my findings align with the notion that design thinking incorporates both convergent and divergent thinking throughout each stage, particularly when confronted with complex problems that lack a straightforward solution (Chasanidou et al., 2015). At the outset of the design thinking process, the identification of problems and the subsequent development of a problem-solving plan were deemed crucial. During this stage, students appeared to engage in divergent thinking, exploring multiple perspectives and generating a range of ideas. Simultaneously, they employed convergent thinking to analyse the situation and assess potential solutions. The iterative nature of problem-finding and problem-solving processes facilitated the generation of diverse ideas and fostered the emergence of novel and creative solutions, drawing upon both convergent and divergent thinking.

This project was undertaken to determine the impacts of an entrepreneurship education course based on design thinking on vocational high school students. The most obvious finding to emerge from this study was that students working on live projects showed different kinds of improvements in entrepreneurial skills in accordance with each stage of design thinking. From the student diaries, I could summarize the most frequently mentioned expressions at each step in design thinking lessons. At the stage of empathizing, communication skills were described as the most improved ability. During the definition stage, students thought that empathy was the most developed skill. At the third stage, which was called ideate, students stated that their creativity was expanded the most. When they jumped into the prototype step, students presented that creativity was the most developed skill again. Finally, students often mentioned the expression, which was related to self-awareness capacity, in the last testing stage.

To be more specific, the most interesting finding from student diary analysis was that the entire entrepreneurship education process based on design thinking played an important role in interpersonal skills. Particularly, communication skills were the most developed in interpersonal skills. In the students' diaries, they thought that teamwork, presentation skills, listening skills, and leadership skills were also improved after the course. In terms of personal maturity, which was the second most highly improved ability, students stated that creativity, self-awareness, and emotional coping were developed through this project. Management skills could be the third developed skill, which includes organizing, summarizing, higher-order thinking skills, and problem-solving skills. In regard to entrepreneurial skills, both environmental scanning and the ability to develop a concept were advanced after the course. Finally, students felt that they also enhanced literacy skills, including writing skills, information search literacy, and computer literacy. Contrary to expectations, the study did not find the development of technical skills, which are managing operations skills, managing supplies and the supply chain skills, office/production space skills, and managing plant and equipment, technology, and production processes skills. Table 11 shows the summary of the data analysis results from this study.

Table 11. Data analysis results from Entrepreneurship education based on design thinking

Entrepreneurial skills	The most developed detailed entrepreneurial skills					Developed detailed entrepreneurial skills on the whole
	Empathize	Define	Ideate	Prototype	Test	
Technical skills	-	-	-	-	-	-
Management skills	-	-	-	-	-	- Organizing - Summarizing - Higher-order thinking skill and Problem-solving skill
Entrepreneurship skills	-	-	-	-	-	- Environmental scanning - The ability to develop a concept - Networking
Personal maturity skills	-	-	Creativity	Creativity	Self-awareness	- Emotional coping - Self-awareness - Creativity
Interpersonal skills	Communication skill	Empathy skill	-	-	-	- Empathy ability - Communication skill - Teamwork - Leadership - Listening - Presentation skill
Literacy skills	-	-	-	-	-	- Writing skill - Information search literacy - Computer literacy

In conclusion, from the data analysis based on the five main themes, it is now possible to state that students who take part in entrepreneurship education based on design thinking may develop interpersonal skills, personal maturity, management skills, entrepreneurship skills, and literacy skills after the course. As a result, this study has gone some way towards enhancing our understanding of the impacts of entrepreneurship education based on design thinking for vocational high school students.

## 5.2 Reflection

In this course, I observed that some students in the group seemed to benefit from the free ride. Some enthusiastic students led the team, but the other students did not participate well in the project. I emphasized that all students should actively participate in this project together, but I could still see some students not actively participating in the class. To solve this problem, I asked her again what her role was in each group, so she could be reminded that she was needed in the group.

Apart from that, students often asked about the activities they should do in this class. They partly understood their work. The reason they asked these was that they did not pay attention to the instructor when the teacher explained the task. Another reason was that I used difficult terms to explain the task to the students. The terms of the design thinking course mostly came from English, so I used Korean translation. These translations might have felt unfamiliar and difficult to students. Therefore, I explained the task with examples of tasks that students had to do after I described it.

Additionally, students tended to find it difficult to answer the first question in the study diary, "What do you think are the objectives of design thinking?". It meant that students did not recognize their learning goals. I thought that students forgot the objectives because they did not complete one step in one day. Thus, to solve this, I asked the students about the goal of this stage once again at the beginning of the lesson so that they could be reminded of the goal.

The findings in this report are subject to at least three limitations. Firstly, the contents of some students diaries were not very rich for thesis analysis. The ability of students to write varied from student to student, and many students had problems with writing diaries at every step of design thinking. At the first stage, students did their best to write diaries. After that, as several stages passed, students tended to write study diaries. As a result, the quantity of student diaries began to decrease, and some students wrote them roughly. Since keeping a learning diary was a performance assessment, students who were not interested in scores might not have been interested in keeping a diary. In addition, some students were not good at writing. I often heard from students that it was hard to put into proper words what they had experienced in this class. They thought that they had a lack of vocabulary. As a result, I found that some students tended to repeat the same words in their diaries. To resolve this, I asked students what they wanted to say and suggested proper vocabularies for their diaries. And then I confirmed that those words were the right words for what they wanted to express in their diaries.

Secondly, it would be better if I had observers or co-teachers in this course. In this course, I was the only facilitator as well as the only observer. As a result, I did not have enough time to check on students, even though I tried to do my best to teach them. In addition, at the first and second steps of design thinking,



students asked many questions about my course. Sometimes, students asked me a lot of questions simultaneously. At that time, I wished I had a co-teacher or a facilitator who would lend me a hand. In this situation, the only solution was to tell the students to wait for their turn for a while and then solve the questions one by one.

Thirdly, the sample size was not large enough to claim any validity from our results. Furthermore, the questionnaire did not measure actual skills and was placed alongside qualitative data gathered from their submitted diaries, so my research only focused on students' self-assessed perceptions about their developed abilities. In fact, these could not be a perfect standard for measuring entrepreneurial skills.

Even though there are several issues in my thesis, the most interesting thing was that all students participated in the lesson enthusiastically. Although some students might not seem to concentrate on the lesson all the time, I might confirm that most students seemed to be very active and enthusiastic about their project. Therefore, it can be demonstrated that design thinking is not an introductory lecture in a fiercely competitive society, but learning by doing through trial and error to solve problems. It can be the best choice for vocational high school students to take entrepreneurship education based on design thinking in a real-life situation.

### **5.3 Discussion**

The diverse controversy about entrepreneurship education for vocational high school students has been going on for over a century. However, few writers have studied the characteristics of vocational high school students through entrepreneurship education. From the teacher's diary, the most interesting finding was about the characteristics of vocational high school students. There are two features about students at vocational high schools in Korea.

Firstly, vocational high school students seem to lack confidence compared to general high school students. In the third teacher's diary, the author mentioned that some students were afraid of expressing their opinions to other students. I thought that many students in vocational high school had low self-esteem or self-confidence because they already had a sense of failure before entering high school. In general, middle school students and their parents in Korea prefer general high school because they prefer their children to go to university after graduation. As a result, vocational high schools have not been popular in Jeju nowadays, and the grades of students entering vocational high schools have been lower than those of students entering general high schools.

Secondly, vocational high school students seem to prefer a practice class. They seem to like learning by

doing. This is the basic philosophy of vocational education. In this design thinking class, most lessons consisted of group activities that had to be done in practice. It was a very distinctive result that most students concentrated on the activity and took part in the lesson enthusiastically every week. After completing all lessons, many students said that they were satisfied with the practice class and enjoyed it as well. Furthermore, the teacher also presented that this course was very worthwhile and satisfactory since all students actively participated in the project, exchanged their opinions and emotions, and all of them grew up with more entrepreneurial skills than before.

#### **5.4 Further study**

This research has thrown up many questions that need further investigation. In this thesis, I only chose female vocational high school students who major in the business administration department, and the number of students is limited. As we confirmed from my thesis that design thinking improves entrepreneurial skills, I would like to demonstrate more about the effects for the other students who are majoring in engineering, agriculture, and so on, as well as male students.

Furthermore, despite the fact that I found out the impacts of entrepreneurship education based on design thinking for vocational high school students in this thesis, I only used thematic analysis for qualitative data, which is based on diaries. Thus, it is recommended that further research be undertaken in quantitative research for finding patterns or averages and generalizing results to wider populations. The findings of this study will have a number of important implications for future practice in the journey of developing an effective entrepreneurship education in Korean vocational high schools.

## REFERENCES

- Aldana, M., Dromer, V., & Leméni, Y. (2019). *Passez au design thinking: penser, construire et mener vos premiers ateliers de cocréation*. Editions Eyrolles.
- Arend, R. J., & Wisner, J. D. (2005). Small business and supply chain management: is there a fit?. *Journal of Business Venturing*, 20(3), 403-436.
- Bailey, C. R., & Bailey, C. A. (2017). *A guide to qualitative field research*. Sage Publications.
- Baron, R. A., & Ensley, M. D. (2006). Opportunity recognition as the detection of meaningful patterns: Evidence from comparisons of novice and experienced entrepreneurs. *Management science*, 52(9), 1331-1344.
- Baron, R. A., & Markman, G. D. (2000). Beyond social capital: How social skills can enhance entrepreneurs' success. *Academy of Management Perspectives*, 14(1), 106-116.
- Beckman, S. L., & Barry, M. (2007). Innovation as a learning process: Embedding design thinking. *California management review*, 50(1), 25-56.
- Bhandari, P. (2022, Nov 24). An introduction to qualitative research. Retrieved from <https://www.scribbr.com/methodology/quantitative-research>
- Blackwell, A. H., & Manar, E. (2015). Prototype. *UXL Encyclopedia of Science*, 3.
- Bolger, N., Davis, A., & Rafaeli, E. (2003). Diary methods: Capturing life as it is lived. *Annual review of psychology*, 54(1), 579-616.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology*, 3(2), 77-101.
- Breakwell, G. M. (Ed.). (2012). *Social work: the social psychological approach*. Springer Science & Business Media.
- Brush, C. G., Greene, P. G., & Hart, M. M. (2001). From initial idea to unique advantage: The entrepreneurial challenge of constructing a resource base. *Academy of Management Perspectives*, 15(1), 64-78.
- Burns, P. (2008), *Entrepreneurship and Small Business*, Palgrave, Basingstoke
- Byun, H. (2015). The influence of design thinking process to develop undergraduates' creativity. *The Journal of creativity education*, 15(3), 149-167.
- Canva. (2023, Mar 1). Introduction. Retrieved from <https://www.canva.com/>
- Carrier, B. (2005). *File system forensic analysis*. Addison-Wesley Professional.
- Chang, J., & Rieple, A. (2013). Assessing students' entrepreneurial skills development in live projects. *Journal of Small Business and Enterprise Development*, 20(1), 225-241.
- Chasanidou, D., Gasparini, A. A., & Lee, E. (2015). Design thinking methods and tools for innovation. In *Design, User Experience, and Usability: Design Discourse: 4th International Conference, DUXU 2015*,

Held as Part of HCI International 2015, Los Angeles, CA, USA, August 2–7, 2015, Proceedings, Part I (pp. 12-23). Springer International Publishing.

Chen, X. P., Yao, X., & Kotha, S. (2009). Entrepreneur passion and preparedness in business plan presentations: a persuasion analysis of venture capitalists' funding decisions. *Academy of Management journal*, 52(1), 199-214.

Choi, Y. K. (2018). A Study on the Influence of Design Thinking Based Entrepreneurial Education on Social Problem Resolution and Resiliency. *Unpublished master's thesis, Keimyung University, Daegu, Korea.*

Clark, A. (2008). *Supersizing the mind: Embodiment, action, and cognitive extension*. OUP USA.

Clarke, V., & Braun, V. (2013). Successful qualitative research: A practical guide for beginners. *Successful qualitative research*, 1-400.

Collins, L. A., Smith, A. J., & Hannon, P. D. (2006). Applying a synergistic learning approach in entrepreneurship education. *Management learning*, 37(3), 335-354.

Corbett, A. C. (2005). Experiential learning within the process of opportunity identification and exploitation. *Entrepreneurship theory and practice*, 29(4), 473-491.

Czerwinski, M., Horvitz, E., & Wilhite, S. (2004, April). A diary study of task switching and interruptions. In *Proceedings of the SIGCHI conference on Human factors in computing systems* (pp. 175-182).

Daniel, A. D. (2016). Fostering an entrepreneurial mindset by using a design thinking approach in entrepreneurship education. *Industry and Higher Education*, 30(3), 215-223.

Ebersberger, B., Herstad, S. J., Iversen, E., Kirner, E., & Som, O. (2011). Open Innovation in Europe. PRO INNO Europe: INNO-Grips II Report.

Elsweiler, D., Mandl, S., & Kirkegaard Lunn, B. (2010, August). Understanding casual-leisure information needs: a diary study in the context of television viewing. In *Proceedings of the third symposium on Information interaction in context* (pp. 25-34).

Fayolle, A., Gailly, B., & Lassas-Clerc, N. (2006). Assessing the impact of entrepreneurship education programmes: a new methodology. *Journal of European industrial training*, 30(9), 701-720.

Galloway, L., Anderson, M., Brown, W., & Wilson, L. (2005). Enterprise skills for the economy. *Education+ Training*.

Gibbs, G. (2010). *Dimensions of quality*. Retrieved from [https://support.webb.uu.se/digitalAssets/91/a\\_91639-f\\_Dimensions-of-Quality.pdf](https://support.webb.uu.se/digitalAssets/91/a_91639-f_Dimensions-of-Quality.pdf)

Glen, R., Suci, C., Baughn, C. C., & Anson, R. (2015). Teaching design thinking in business schools. *The International Journal of Management Education*, 13(2), 182-192.

Goleman, D. (1995). *Emotional Intelligence*. New York, NY: Bantam Books

Gonen, E. (2020). Tim brown, change by design: how design thinking transforms organizations and inspires innovation (2009). *Markets, Globalization & Development Review*, 4(2).

Gonzalez-Padron, T., Hult, G. T. M., & Calantone, R. (2008). Exploiting innovative opportunities in global purchasing: An assessment of ethical climate and relationship performance. *Industrial Marketing*

*Management*, 37(1), 69-82.

Haberberg, A., & Rieple, A. (2008). *Strategic management: Theory and application*. Oxford University Press.

Handfield, R., Petersen, K., Cousins, P., & Lawson, B. (2009). An organizational entrepreneurship model of supply management integration and performance outcomes. *International Journal of Operations & Production Management*.

Hannon, P. D. (2006). Teaching pigeons to dance: sense and meaning in entrepreneurship education. *Education+ Training*.

Henriksen, D., Richardson, C., & Mehta, R. (2017). Design thinking: A creative approach to educational problems of practice. *Thinking skills and Creativity*, 26, 140-153.

Herrmann, K., Hannon, P., Cox, J., Ternouth, P., & Crowley, T. (2008). *Developing entrepreneurial graduates: putting entrepreneurship at the centre of higher education* (p. 36). London: NESTA.

Honig, B. (2004). Entrepreneurship education: Toward a model of contingency-based business planning. *Academy of management learning & education*, 3(3), 258-273.

Jeju girl's commercial high school. (2023, May 1). Introduction to School. Retrieved from <https://jejugc.jje.hs.kr/jejugc/0107/sub>

Kelley, D., Bosma, N., & Amorós, J. E. (2010). Global entrepreneurship monitor global report. *Babson College, Universidad delDesarrollo and London Business School, US, Chile and UK*.

Kelley, T., & Kelley, D. (2013). *Creative confidence: Unleashing the creative potential within us all*. Currency.

KERIS. (2022, April 10). School info. Retrieved from [https://www.schoolinfo.go.kr/ei/ss/Pneiss\\_b01\\_s0.do](https://www.schoolinfo.go.kr/ei/ss/Pneiss_b01_s0.do)

KERIS. (2023, April 1). School statistics. Retrieved from <https://www.hifive.go.kr/stats/schStats.do?rootMenuId=98&menuId=9801&sType=A7>

Kimbell, L. (2011). Designing for service as one way of designing services. *International journal of design*, 5(2).

Ko, H. R. & Hong, C. N. (2016). Effect Analysis of Short-term Start-up Education Program: Mainly with the Start-up Circle in D University. *Journal of Local Education Management*, 19(1), 67-87.

KOSIS. (2023, April 1). Population in Jeju. Retrieved from [https://kosis.kr/statHtml/statHtml.do?orgId=101&tblId=DT\\_1B040A3&checkFlag=N](https://kosis.kr/statHtml/statHtml.do?orgId=101&tblId=DT_1B040A3&checkFlag=N)

Kutzhanova, N., Lyons, T. S., & Lichtenstein, G. A. (2009). Skill-based development of entrepreneurs and the role of personal and peer group coaching in enterprise development. *Economic Development Quarterly*, 23(3), 193-210.

Ladzani, W. M., & Van Vuuren, J. J. (2002). Entrepreneurship training for emerging SMEs in South Africa. *Journal of small business management*, 40(2), 154-161.

Lanius, C., Weber, R., Spiegle, J., Robinson, J., & Potts, R. (2020). Drawing on personas: How user personas affect creativity. *Technical Communication*, 67(4), 48-70.

Lawson, B. (2006). *How designers think*. Routledge.

- Lee, J. I. & Seo, J. S. (2019). *Introduction to Entrepreneurship*. Seoul, Republic of Korea: Samyang Media.
- Lee, S. J. & Yoon, O. H. (2021). Effect of Applied Design Thinking Courses. *Korean Journal of General Education*, 15(4), 205-215.
- Lichtenstein, G. A., & Lyons, T. S. (1996). Incubating new enterprises.
- Liedtka, J., & Ogilvie, T. (2011). *Designing for growth: A design thinking tool kit for managers*. Columbia University Press.
- Lyons, T. S., & Lyons, J. S. (2002, November). Assessing entrepreneurship skills: The key to effective enterprise development planning. In *44th Annual Conference of the Association of Collegiate Schools of Planning*. Baltimore, Maryland (pp. 21-24).
- Mackrill, T. (2008). Solicited diary studies of psychotherapy in qualitative research—pros and cons. *European journal of psychotherapy and counselling*, 10(1), 5-18.
- Marlborough School. (2019, Aug 29). Five Benefits of Entrepreneurship Education to Students. Retrieved from <https://www.marlborough.org/news/~board/stem/post/five-benefits-of-entrepreneurship-education-to-students>
- Mayer, J. D., & Caruso, D. (2002). The effective leader: Understanding and applying emotional intelligence. *Ivey business journal*, 67(2), 1-5.
- Micheli, P., Wilner, S. J., Bhatti, S. H., Mura, M., & Beverland, M. B. (2019). Doing design thinking: Conceptual review, synthesis, and research agenda. *Journal of Product Innovation Management*, 36(2), 124-148.
- Milligan, C., Bingley, A., & Gatrell, A. (2005). Digging deep: Using diary techniques to explore the place of health and well-being amongst older people. *Social science & medicine*, 61(9), 1882-1892.
- Mind Tools Content Team. (2023, Apr 29). Round-Robin Brainstorming. Retrieved from <https://www.mindtools.com/a81qk8y/round-robin-brainstorming>
- Ministry of Education & Korean educational development institute. (2023, May 3). The rate of employment rate of vocational high school graduates. Retrieved from [https://kess.kedi.re.kr/publ/publFile/pdfjs?survSeq=2022&menuSeq=3645&publSeq=3&menuCd=92097&itemCode=02&menuId=1\\_4&language=](https://kess.kedi.re.kr/publ/publFile/pdfjs?survSeq=2022&menuSeq=3645&publSeq=3&menuCd=92097&itemCode=02&menuId=1_4&language=)
- Ministry of Education. (2015). *The National Curriculum for the Primary and Secondary Schools*. Korea. Retrieved from <https://ncic.re.kr/english.kri.org.inventoryList.do>
- MiriCanvas. (2023, Mar 1). Introduction. Retrieved from <https://www.miricanvas.com/>
- Morris, M. H., Kuratko, D. F., & Schindehutte, M. (2001). Towards integration: understanding entrepreneurship through frameworks. *The international journal of entrepreneurship and innovation*, 2(1), 35-49.
- Morris, M. H., Schindehutte, M., & LaForge, R. W. (2002). Entrepreneurial marketing: a construct for integrating emerging entrepreneurship and marketing perspectives. *Journal of marketing theory and practice*, 10(4), 1-19.
- Mural. (2023, Mar 3). Introduction. Retrieved from <https://mural.co/>

Musu-Gillette, L., Robinson, J., McFarland, J., KewalRamani, A., Zhang, A., & Wilkinson-Flicker, S. (2016). Status and Trends in the Education of Racial and Ethnic Groups 2016. NCES 2016-007. *National Center for Education Statistics*.

Nabi, G., Liñán, F., Fayolle, A., Krueger, N., & Walmsley, A. (2017). The impact of entrepreneurship education in higher education: A systematic review and research agenda. *Academy of management learning & education*, 16(2), 277-299.

Neck, H. M., & Greene, P. G. (2011). Entrepreneurship education: known worlds and new frontiers. *Journal of small business management*, 49(1), 55-70.

Nielsen, S. L., & Stovang, P. (2015). DesUni: university entrepreneurship education through design thinking. *Education+ Training*, 57(8/9), 977-991.

Oakey, R. P. (2003). Technical entrepreneurship in high technology small firms: some observations on the implications for management. *Technovation*, 23(8), 679-688.

Purao, S., & Suen, H. (2010, May). Designing a multi-faceted metric to evaluate soft skills. In *Proceedings of the 2010 Special Interest Group on Management Information System's 48th annual conference on Computer personnel research on Computer personnel research* (pp. 88-91).

Richardson, I., & Hynes, B. (2008). Entrepreneurship education: towards an industry sector approach. *Education+ Training*.

Rosenbaum, M. S., Otolora, M. L., & Ramírez, G. C. (2017). How to create a realistic customer journey map. *Business horizons*, 60(1), 143-150.

Salazar, K. (2016). Diary studies: Understanding long-term user behavior and experiences. *Nielsen Norman Group*.

Saxenian, A. (2002). Transnational communities and the evolution of global production networks: the cases of Taiwan, China and India. *Industry and innovation*, 9(3), 183-202.

Schmidt, J. J., Soper, J. C., & Facca, T. M. (2012). Creativity in the entrepreneurship classroom. *Journal of Entrepreneurship Education*, 15, 123.

Seet, P., & Seet, L. (2006). Changing entrepreneurial perceptions and developing entrepreneurial competencies through experiential learning: Evidence from entrepreneurship education in Singapore's tertiary education institutions.

Serrat, O., & Serrat, O. (2017). The SCAMPER technique. *Knowledge solutions: tools, methods, and approaches to drive organizational performance*, 311-314.

Seyedi, R., Moradnezehadi, H., & Mehdizadeh, H. (2021). Investigating Effect of Teaching Methods of lectures and guest lectures on Enhancing Business and Entrepreneurial Skills of Trainees in Eyvan Woman Technical and Vocational Training Center. *Research in Teaching*, 9(2), 300-274.

Shane, S. (2000). Prior knowledge and the discovery of entrepreneurial opportunities. *Organization science*, 11(4), 448-469.

Singapore Management University. (2023, Mar 3). Lesson planning. Retrieved from <https://cte.smu.edu.sg/approach-teaching/integrated-design/lesson-planning>

- Smith, P. J., Henry, J., & Munro, G. (2002). Training young people through a school/enterprise partnership: a longitudinal study. *Education+ Training*.
- Smith, W. L., Schallenkamp, K., & Eichholz, D. E. (2007). Entrepreneurial skills assessment: an exploratory study. *International Journal of Management and Enterprise Development*, 4(2), 179-201.
- Song, W. G. (2014). Current status of university start-up education support policy and improvement plan. *Korean Journal of Business Administration*, 25(2), 833-857.
- Stanford's Design School. (2009). *Bootcamp Bootleg*. Retrieved from <https://achieve.lausd.net/cms/lib/CA01000043/Centricity/domain/21/principals%20summer%20instituti%202015/Bootcamp%20Bootleg%20-%20Design%20School.pdf>
- Sukanya, S. (2008). Tourism, technology and the entrepreneur: a case study from Northeast India. *ICFAI Journal of Business Strategy*, 5(4), 71-80.
- Timmons, J. A., & Spinelli Jr, S. (2009). New venture creation: entrepreneurship for the 21st century. *Language*, 31(666p), 26cm.
- Tschimmel, K. (2012). Design Thinking as an effective Toolkit for Innovation. In *ISPIM Conference Proceedings* (p. 1). The International Society for Professional Innovation Management (ISPIM).
- Tyebjee, T. T., & Bruno, A. V. (1984). A model of venture capitalist investment activity. *Management science*, 30(9), 1051-1066.
- Val, E., Gonzalez, I., Iriarte, I., Beitia, A., Lasa, G., & Elkoro, M. (2017). A design thinking approach to introduce entrepreneurship education in European school curricula. *The Design Journal*, 20(sup1), S754-S766.
- VanGundy, A. B. (1984). Brain writing for new product ideas: an alternative to brainstorming. *Journal of Consumer Marketing*.
- Voltage Control. (2021, Oct 7). How to Successfully Facilitate a Meeting. Retrieved from <https://medium.com/voltage-control/how-to-successfully-facilitate-a-meeting-7891aba9f9a7>
- Von Graevenitz, G., Harhoff, D., & Weber, R. (2010). The effects of entrepreneurship education. *Journal of Economic behavior & organization*, 76(1), 90-112.
- Wujec, T. (2013, Nov 12). The marshmallow challenges. Retrieved from [https://d1wqtxts1xzle7.cloudfront.net/36420064/TED2010\\_Tom\\_Wujec\\_Marshmallow\\_Challenge\\_Web\\_Version-libre.pdf?1422400612=&response-content-disposition=inline%3B+filename%3DThe\\_Marshmallow\\_Challenge.pdf&Expires=1683772527&Signature=dLcfhgp6eHD2EuNBVWllatwWjj8IHPXlyBcSokc2POrUOBrlbn4mwTuqJm6ctXrraWv9~xCr3jUatMVq0h84oRLsXg67osfPra68MsMFoNWDx4530TaOePQOyZhONH34rRz~AbjD9aOeb8H6G9WnNZuMKRE5u9CUEtODFmj99TD6~diMuPE202HtLhI7WJcKQt6kVxPqQZY5bjsFvCFU4yO7GDVIAvgrsFFJdUAJwqjL3G19pUWTZxqFE7eBL-AwZIV1xniUCUy0AmrLDJ6-Qd66MtWQP5wMBV0L0McsPC1thC-2VTKURBgeLXu0taoHurUS3NkA4MKx5SgHHkbrg\\_\\_&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA](https://d1wqtxts1xzle7.cloudfront.net/36420064/TED2010_Tom_Wujec_Marshmallow_Challenge_Web_Version-libre.pdf?1422400612=&response-content-disposition=inline%3B+filename%3DThe_Marshmallow_Challenge.pdf&Expires=1683772527&Signature=dLcfhgp6eHD2EuNBVWllatwWjj8IHPXlyBcSokc2POrUOBrlbn4mwTuqJm6ctXrraWv9~xCr3jUatMVq0h84oRLsXg67osfPra68MsMFoNWDx4530TaOePQOyZhONH34rRz~AbjD9aOeb8H6G9WnNZuMKRE5u9CUEtODFmj99TD6~diMuPE202HtLhI7WJcKQt6kVxPqQZY5bjsFvCFU4yO7GDVIAvgrsFFJdUAJwqjL3G19pUWTZxqFE7eBL-AwZIV1xniUCUy0AmrLDJ6-Qd66MtWQP5wMBV0L0McsPC1thC-2VTKURBgeLXu0taoHurUS3NkA4MKx5SgHHkbrg__&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA)



## **APPENDICES**

Appendix 1: Lesson Plans for 7 weeks

Appendix 2: Student diary form

Appendix 3: Teacher diary form

Appendix 4: Consent form for students

Appendix 5: Consent form for conducting research

<b>Course</b>	Entrepreneurship	<b>Date</b>	Week1
<b>Stage</b>	Preparation		
<b>Objectives</b>	<ul style="list-style-type: none"> <li>- Students get to know each other by taking part in a drawing persona activity.</li> <li>- Students understand the definition and process of design thinking.</li> </ul>		
<b>Lesson Plan</b>			
<b>Procedure</b>	<b>Activities</b>	<b>Time</b>	
Orientation	<p>[Introduction]</p> <ol style="list-style-type: none"> <li>1. The teacher introduces himself.</li> <li>2. The teacher introduces the course, including evaluation.</li> <li>3. Students can ask questions about the course.</li> </ol> <p>[Activity 1] Introduction - Drawing persona</p> <ol style="list-style-type: none"> <li>1. The teacher explains the process of drawing personas.</li> </ol> <p>*Drawing persona: Students draw their persona which describes their personality, characters, traits, habits, hobbies, favorite things and so on.</p> <ol style="list-style-type: none"> <li>2. Students draw their persona for 10 minutes.</li> <li>3. One student gives a presentation about their picture. The presentation is about the description of their picture and the reason why they chose that picture.</li> <li>4. Students put pictures on the wall in classroom.</li> <li>5. The teacher and students talk about what they felt during activity in a free atmosphere.</li> </ol>	50min	
Introduction to Design thinking	<ol style="list-style-type: none"> <li>1. The teacher asks a question to the students. "What do these companies (ZARA, Korean Air, and Netflix) have in common?"</li> <li>2. A teacher tells students about the trend of the business environment in the 2020s.</li> <li>3. The teacher introduces IEDO design thinking and the definition of design thinking.</li> <li>4. The teacher also explains the process of design thinking. (Empathize, Define, Ideate, Prototype, Test)</li> <li>5. The teacher explains the double diamond model in design thinking.</li> <li>6. The teacher introduces an 8-week design thinking project.</li> </ol>	50min	
Team building & Introduction to	<p>[Activity 2] Marshmallow Game</p> <ol style="list-style-type: none"> <li>1. Make a group of 4 students.</li> <li>2. Distribute spaghetti noodles and marshmallows to each group.</li> <li>3. Build the tower as high as possible using the materials within 20 minutes.</li> <li>4. Prizes are awarded to the first place team.</li> <li>5. Share your experience with all students.</li> </ol>	50min	

Project	<p>[Introduction to Project]</p> <p>1. After finishing the activity, the teacher introduces students to the design thinking project.</p> <p>*Project Topic: Developing a product or service that can address inequality in our society</p> <p>2. The teacher gives students examples of inequality in our society. ex) gender inequality, education inequality, digital inequality, etc.</p> <p>3. Students discuss and determine their role in this project.</p> <p>*Role</p> <p>A. Coach: Hold a meeting.</p> <p>B. Secretary: Take notes and record the decision.</p> <p>C. Time-boxer: Manage schedules and keep timing.</p> <p>D. Decision maker : Make decisions quickly, make sure everyone can agree on them and communicate with outside</p>	
---------	---	--

<b>Course</b>	Entrepreneurship	<b>Date</b>	Week2
<b>Stage</b>	Empathize		
<b>Objectives</b>	- Students draw a stakeholder map and do interviews to empathize with the users.		
<b>Lesson Plan</b>			
<b>Procedure</b>	<b>Activities</b>	<b>Time</b>	
Stakeholder map	<p>[Activity 1] Decide the topic</p> <ol style="list-style-type: none"> <li>1. Remind students of the project's topic.</li> <li>2. Students discuss which equality to choose for their team.</li> <li>3. Take a poll and decide the topic with your team.</li> </ol> <p>[Stakeholder map]</p> <ol style="list-style-type: none"> <li>1. Introduce the first step: empathize.</li> <li>2. Explain a stakeholder map.</li> <li>3. Students draw the stakeholder map in teams using Mural.</li> <li>4. Briefly share their outcomes with other students.</li> </ol>	50min	
User interview	<ol style="list-style-type: none"> <li>1. The teacher explains the user interview. <ul style="list-style-type: none"> <li>- Make a questionnaire.</li> <li>- Decide who will be interviewed and how many people will be interviewed.</li> <li>- Conduct an interview (at least 5 interviewees).</li> <li>- Summarize the interview.</li> </ul> </li> <li>2. Share with team members</li> <li>3. Briefly share their outcomes with other students.</li> </ol>	100min	

<b>Course</b>	Entrepreneurship	<b>Date</b>	Week3
<b>Stage</b>	Define		
<b>Objectives</b>	- Students draw a customer persona, empathy map, or journey map to define the problem. - Students define the problem statement.		
<b>Lesson Plan</b>			
<b>Procedure</b>	<b>Activities</b>	<b>Time</b>	
Customer Persona & Journey map or Empathy map.	1. Remind yourself of the previous step. 2. introduce the second step, Define. 3. Explain a customer persona, a journey map, and an empathy map. 4. Students draw the customer persona and the journey map, or an empathy map, in a team using murals.	100min	
Problem statement	1. Students complete the problem statement in teams using Mural. * Problem statement Who is the user? What is the problem? What are their needs? 2. Briefly share their outcomes with other students.	50min	

<b>Course</b>	Entrepreneurship	<b>Date</b>	Week4
<b>Stage</b>	Ideate		
<b>Objectives</b>	<ul style="list-style-type: none"> <li>- Students do brainstorming, round robin, and SCAMPER for ideation.</li> <li>- Students make a decision on their product or service.</li> </ul>		
<b>Lesson Plan</b>			
<b>Procedure</b>	<b>Activities</b>	<b>Time</b>	
Brainstorming	<ol style="list-style-type: none"> <li>1. Remind yourself of the previous step.</li> <li>2. Introduce the third step; Ideate</li> <li>3. Explain brainstorming.</li> <li>4. Students do brainstorming using Mural.</li> </ol>	50min	
Round robin	<ol style="list-style-type: none"> <li>1. Students pick up several ideas from the brainstorming.</li> <li>2. Explain how to do the round robin.</li> <li>3. Students do the round robin using Mural, and specify the idea.</li> </ol>	50min	
SCAMPER & Decision making	<ol style="list-style-type: none"> <li>1. Students pick up the idea from the Round robin.</li> <li>2. Explain how to do SCAMPER.</li> <li>3. Students do SCAMPER by using Mural, and enrich the idea.</li> <li>4. Make a decision about their product or service.</li> </ol>	50min	

<b>Course</b>	Entrepreneurship	<b>Date</b>	Week5
<b>Stage</b>	Prototype		
<b>Objectives</b>	- Students make prototypes.		
<b>Lesson Plan</b>			
<b>Procedure</b>	<b>Activities</b>	<b>Time</b>	
Prototype	<ol style="list-style-type: none"> <li>1. Remind yourself of the previous step.</li> <li>2. Introduce the fourth step; Prototype</li> <li>3. Explain how to make a prototype.</li> <li>4. Students make prototypes by using various tools.</li> </ol> <p>* ex) catalogue, poster, prototype sketch, story board, video, web page, App UI etc.</p>	150min	

<b>Course</b>	Entrepreneurship	<b>Date</b>	Week6
<b>Stage</b>	Test & Presentation preparation		
<b>Objectives</b>	<ul style="list-style-type: none"> <li>- Students test their prototype and get feedback.</li> <li>- Students make a correction with the feedback and complete the final product or service.</li> </ul>		
<b>Lesson Plan</b>			
<b>Procedure</b>	<b>Activities</b>	<b>Time</b>	
Test	<ol style="list-style-type: none"> <li>1. Remind yourself of the previous step.</li> <li>2. Introduce the fifth step: Test</li> <li>3. Explain why the prototype test is necessary and how to get feedback.</li> <li>4. Students prepare for the questions about the end-user interview on the prototype.</li> <li>5. Students conduct prototype tests with at least five people.</li> <li>6. Students get feedback from the interview and modify their prototype.</li> </ol>	100min	
Presentation preparation	<p>Students prepare for their presentation by using PowerPoint or other tools.</p> <p>*Presentation time : 10 -15minutes</p>	50min	



<b>Course</b>	Entrepreneurship	<b>Date</b>	Week7
<b>Stage</b>	Presentation		
<b>Objectives</b>	<ul style="list-style-type: none"> <li>- Students make a presentation about their final product or service.</li> <li>- Students reflect on the whole project and share their experience with others.</li> </ul>		
<b>Lesson Plan</b>			
<b>Procedure</b>	<b>Activities</b>	<b>Time</b>	
Presentation	<ol style="list-style-type: none"> <li>1. Each team comes out and gives a presentation.</li> <li>2. Students reflect on the whole project and share their experience with others.</li> <li>3. Students write down the last student diary.</li> <li>4. Students conduct a satisfaction survey about the course.</li> </ol>	150min	

## &lt;Student Diary&gt;

Name		Week	Week 2-6
<i>Question</i>		<i>Answer</i>	
What do you think the objectives of today's lesson are?			
What are you trying to achieve with each one of them?			
How did you feel after today's lesson? Why did you feel like that?			
What did you find difficult in today's lesson?			
What did you do to overcome these difficulties?			
Have you developed any skills in today's lesson? If so, please describe them.			
Would you like to develop any skills more? If so, please describe them.			
Feel free to add anything about the session that you haven't mentioned at this point.			

## <Student Diary>

Name		Week	Week7
Question		Answer	
What do you think are the objectives of design thinking?			
Have you developed any skills in the entire design thinking process? If so, please describe them.			
Would you like to develop any skills further after this class? If so, please describe them.			
Feel free to add anything about the session that you haven't mentioned at this point.			

## &lt;Teacher diary&gt;

Name		Week	
<i>Question</i>		<i>Answer</i>	
What do you think the objectives of today's lesson are?			
What are you trying to teach each one of them?			
How did you feel after today's lesson? Why did you feel like that?			
What did you find difficult in today's lesson?			
What did you do to overcome these difficulties?			
What skills do you think students developed in today's lesson?			
What skills do your students want to achieve?			
Feel free to add anything about the session that you haven't mentioned at this point.			

## <Consent Form for Students>

### **Informed consent for participating in this master's research**

This informed consent form provides you, as the participant with general information about the research, its purpose, and your rights as a participant.

### **Researcher**

My name is Kwangkyu Lee, and I am a master's student in Education Entrepreneurship at the Oulu University of Applied Sciences in Finland. I am currently working as a commercial teacher at Jeju Girl's Commercial High School, and teaching Entrepreneurship to the 3<sup>rd</sup> grade students in the first semester of 2022.

### **Description of the research**

This case-study research is part of my thesis for my master's degree. The goal of this research is to understand how an entrepreneurship education course (based on design thinking) impacts the development of entrepreneurial skills in vocational high school students.

### **Participation**

Your participation will involve writing a student diary about your experience being part of the process in this course. This diary will account for 20% of the performance evaluation as a student process folio this semester.

Furthermore, some of you will be asked to participate in semi-structured interviews at the end of this course. The only information I will collect will be through the short questionnaire and audio recording of the interview. The interview will be conducted in person or online.

However, your participation in this research study is voluntary. You may choose not to participate, and you may withdraw your consent to participate at any time. You will not be penalized in any way should you decide not to participate in or withdraw from this study.

## Data Collection

All information that is collected will remain confidential and be anonymized. You will be asked to come up with your own codename or nickname to be used to identify your data. No personal details that enable identifying you will be included in the analyses, discussion, and reporting of the data. I only have access to the data that has been collected from the participant. The data you provided will be discarded after the thesis has been assessed and approved by Oulu University of Applied Sciences. The collected data will not be used for any other purposes apart from possible further research. All data will be collected in Korean and translated into English for analysis.

The result of my thesis may be published in journals, articles, conferences, or other media in the future.

## Confirming informed consent

- I am willing to participate in the research.
- I allow the use of my diary and audio recordings for research purposes.
- I allow the information that I have provided to be used until the thesis has been assessed and approved by Oulu University of Applied Sciences.

Participant's Signature

Participant's Name

Date

---

---

---

## Contact information

Kwangkyu Lee

kyu815@korea.kr

## This thesis research is supervised by:

Sari Alatalo, Oulu University of Applied Sciences

## Consent form for conducting research

### Consent statement

On behalf of Jeju Girl's Commercial High School, I agree to have research conducted within the organization, by researcher Kwangkyu Lee, a student of the Master program in Education Entrepreneurship from Oulu University of Applied Sciences.

I acknowledge that the study explores how an entrepreneurship education course (based on design thinking) impacts the development of entrepreneurial skills in vocational high school students and includes the following:

- students writing diaries on their experience being part of the process in this course, which will account for 20% of the performance evaluation as a student process folio in this semester.
- students participating in recorded semi-structured interviews at the end of the course
- the collected data will be used only for research purposes and destroyed after the thesis has been approved.

Individual consent forms will be provided to each individual participant prior to their participation, and they hold the right to withdraw their consent at any point in time.

Equally, Jeju Girl's Commercial High School holds the right to withdraw its consent at any point in time with no obligation to justify.

I understand that if Jeju Girl's Commercial High School does withdraw, the organization's data may not be erased but will only be used in an anonymized form. The data collected will be used for the sole purpose of research.

Date \_\_\_ / \_\_\_ / 2022

---

Representative name (in capital letters)

Principal

Jeju Girl's Commercial High School

---

Researcher

Kwangkyu Lee

kyu815@korea.kr

This research is supervised by:

Sari Alatalo, Oulu University of Applied Sciences