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Development of Life Skills Program for Primary School Students: Focus on Entry Programming

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Abstract: There are areas where the competencies obtained through computer coding activities substantially overlap with life skills components. Studies of these common competencies have suggested the possibility of including these contents in a life skills program. Therefore, the purpose of this study was to develop a program through the Entry program that elementary school students could use online to improve their life skills, given the need to increase contactless online classes due to COVID-19. Eight elementary school teachers with 20 years of experience and two curriculum experts participated in the program's development. For data collection, 360 data points were collected from eight elementary schools located in each Korean province, including urban and rural areas. SPSS 21.0 was used to analyze the data. Upon completing the 8-week program, the difference in life skills between groups was confirmed using variance analysis based on the number of implementation times, and post-hoc testing was conducted. The study's results confirmed the difference between the groups conducted for two weeks (M = 3.22), four weeks (M = 3.25), and six weeks (M = 3.67), and the group conducted for eight weeks (M = 3.83). In other words, as the number of weeks of participation in the life skills program increased, there was a difference between groups. These findings suggest a life skills program could be included as part of Entry based computer coding activities for elementary school students through a backward curriculum. In conclusion, this study showed the possibility of using contactless online classes with free Entry-based websites to improve the life skills of elementary school students struggling at home due to COVID-19. It also showed that each elementary school teacher could operate the life skills programs as a contactless learning method using a free coding platform and manual.

Keywords: life skills; Entry platform; backward curriculum; elementary school students

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1. Introduction

Changes to daily life related to the Fourth Industrial Revolution are taking place at home and abroad. To keep up with the Fourth Industrial Revolution's global trend, which will further advance the so-called 'hyper-connected society' and 'super-intelligent society' through the convergence and integration of industries, nations and individuals must prepare themselves for this eventuality. This is especially true when considering the job changes the Fourth Industrial Revolution will bring. The Fourth Industrial Revolution, where 5G technology is the norm, will result in an industrial revolution in which human desires for convenience through artificial intelligence (AI) and the Internet of Things are accomplished using AI robots instead of humans performing complex tasks [1]. The Fourth Industrial Revolution, which was officially mentioned at the World Economic Forum held in Davos, Switzerland, in 2016, differs slightly according to scholars.

However, it is generally agreed that in the future, machines, artificial intelligence, the Internet of Things, and smart AI robots will replace humans, taking over most of the work that requires judgment [2]. In order to cultivate expertise in dealing with AI robots, it is necessary to understand software fundamentals. When it comes to understanding software, studies show that teaching at a younger age enhances things such as language education [3]. Enthusiasm for introducing software education, especially coding education,

at a young age is increasing worldwide. Although each country's coding education has distinct characteristics and features, the goal of fostering human resource development in terms of national competitiveness is something they have in common [4].

On the other hand, these software competencies are focused on one's career and happiness from a personal perspective. Developing personal competencies for social change increases one's competitiveness in society. There are usually various types of competitiveness, such as knowledge, language, skill, physical strength, academic qualification, etc. Still, the life skills that are the psychological and physical basis of these things cannot be over emphasized. Countries and scholars define life skills in various ways. Still, many agree that creativity, empathy, problem-solving, communication, etc., are essential cognitive, emotional, and social factors for individuals to live as members of society [5].

These capabilities are still required, despite the changes brought by the Fourth Industrial Revolution [1]. Several programs promote these competencies, which are needed more now than ever before. However, there have been few studies linking software activities with life skills. At a time when public social life has become difficult due to the COVID19 pandemic, software education using a free open platform is an advantageous form of contactless online education. As a result, this study hypothesized that education centered on the Entry platform as a program to improve the life skills of elementary school students could affect a student's life skills. Therefore, this study aimed to develop a life skills program for elementary school students focusing on the Entry platform.

2. Examples of Coding Education in Several Countries

Worldwide, coding education is conducted in various ways to suit each country's national characteristics. National support and aspirations for coding education is increasing globally. According to foreign media such as The Wall Street Journal, Chinese parents spend over $1000 a year on coding classes. This is primarily influenced by the Chinese government's emphasis on IT (information technology) education. China began mandating 70 h of software education per year from the third grade of elementary school in 2001, and artificial intelligence classes are required for high school students [4].

Next, in India, where the class-based society reinforces the caste system, coding education is a way to raise one's status through employment in global IT companies. Thus, coding education's appeal is greater in India than in any other country. The Indian government views IT talent as critical to its national competitiveness. Software education has been a required subject in Indian elementary, middle, and high schools since 2010. High school students generally learn major coding languages such as C++ and Javascript. According to a 2016 Barclays report, India produces about ten times more people skilled in coding skills than the United States [6]. However, the report highlights that India's focus on the mass production of good technical coders rather than creative talent is a limitation. In India, there is a street called SAP, known as the hub of software education. The day begins with 100,000 trainees who want to learn IT technology [7]. Indian-Americans, such as Microsoft's Satya Narayana, Google's Sundar Pichai, Adobe's Shantanu Narayen, and Harman International's Dinesh Paliwal, were all born and educated in India [8]. In addition, they were all entrepreneurs who started their own companies. After larger companies acquired their companies, they led stable lives as business executives at other companies.

In the United States, coding education policies vary from state to state, but many public schools, including California, Florida, and Arkansas, have incorporated coding into their standard curriculum. These schools teach coding with free programs distributed by Silicon Valley IT companies such as Google, Facebook, Microsoft, and Apple. The coding program created by a leading IT company is close to play. It does not focus on teaching 'computing language' but instead on a process that fosters 'thinking skills to structure problems' and induces educational effects through programming activities closely related to play activities [9].

The UK, the birthplace of the Industrial Revolution, has made coding education mandatory for all grades since September 2014. Students begin writing simple programs at

five years old, and from the age of 11, they learn programming languages with the same methodology used to teach foreign languages. A primary characteristic of British coding education is convergence education. In other words, coding education is composed of subjects such as science, technology, engineering, and mathematics to form convergence education. It focuses on enhancing problem-solving skills and creativity through coding and improving science mathematics-based knowledge. In the UK, the primary school app development curriculum consists of six steps. The first step is planning the app, the second is project composition and role allocation, the third is market research and idea derivation, the fourth is the composition and design of the app menu, the fifth is coding education, and the sixth is the product's market disclosure [10].

Software education for elementary students in the fifth grade was included in Korea's 2015 revised curriculum. Some units focused on improving students' coding competencies and were organized in the approved textbook. Currently, coding education is partially organized in several textbooks and is often conducted as an after-school activity. Then, what are the implications of coding education in these domestic and overseas coding education cases? Firstly, hardware and software education must be developed in a balanced manner. Secondly, fun and interest should play a role as a driving force for participation in software education. Therefore, software education should be implemented as an interesting level-specific computing activity in elementary, middle, and high school levels to increase voluntary participation. Thirdly, coding education should not involve just the screen and monitor. Instead, coding technology beyond the computer screen should be used, and educational activities must be extended to physical coding. Fourthly, an open platform with economic feasibility should be provided to introduce students' coding programs to the market. Fifth, in terms of equality in education, coding education should have a social enterprise character so that it is not proportional to the cost and should be positioned as a fair life education concept that can resolve educational inequality.

3. Entry Program Features

Elementary schools have focused on improving computing thinking through block coding, which is similar to game-based activities. In middle school, emphasis has been placed on laying the software foundation through text coding using a coding language. In high school, input coding focuses on using a robot that moves through a physical computer. This AI-related education requires individual creativity, and its creative design emphasizes open and cooperative characteristics [9]. Compared to traditional classes, learning based on innovative design increases learners' motivation for learning, giving them a sense of satisfaction and self-efficacy, motivating them to continue. It is also effective in metacognition, cooperative attitude, problem-solving, and exploration skills [11].

The Entry platform has various content that uses creative design to teach learners. 'Entry' is a non-profit coding software education platform developed by KAIST University in Korea and later acquired by Naver. Developed using a block-type language rather than the existing text coding, it consists of four main menus: Learn, Create, Share, and Community with a graphics-based program. Therefore, the design allows elementary school students and beginners to learn very quickly, as shown in Figure 1 below. The program's drag and drop method uses a mouse and is similar to assembling Lego blocks. By employing block coding, gaming and language students use daily, students in lower grades can understand the programming language. The program's advantage is the sense of accomplishment it creates because students can select their elementary or middle school level, perform coding activities, and create and share their work. Additionally, Entry is a JavaScript-based program with fairly good compatibility, and thus works with smartphones and tablet PCs without an app. Starting with a simple change of direction or movement, one can create complex games or animations, share them with friends, and receive feedback.

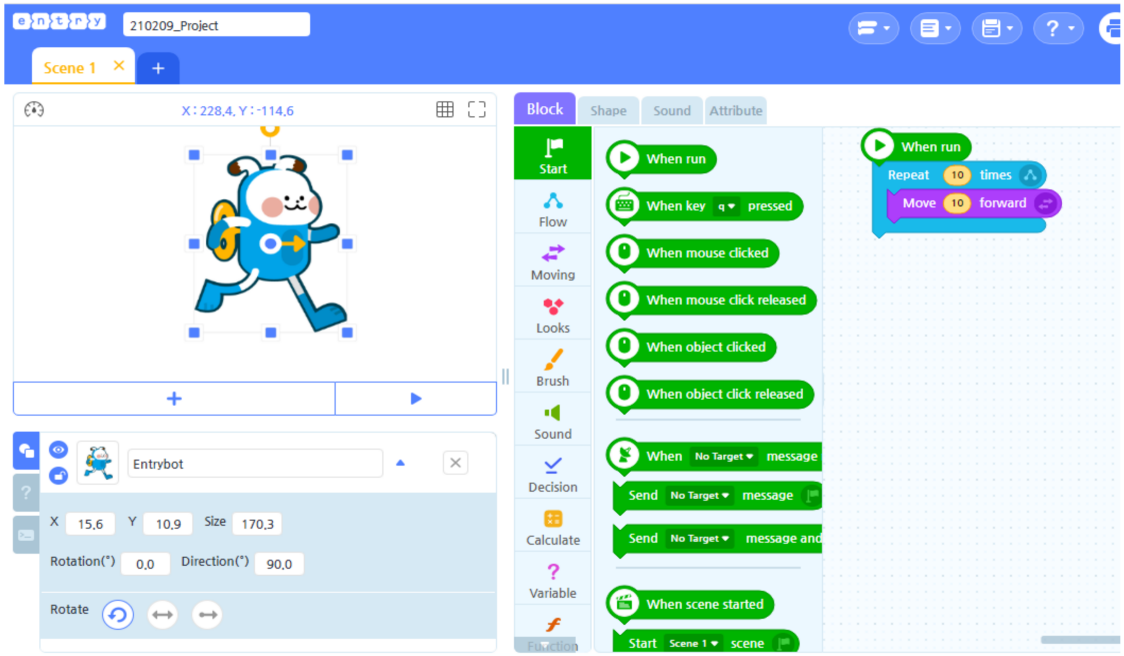


Figure 1. Screen example of Entry program.

However, the most significant advantage is that it is a free web-based platform that economically disadvantaged students can use. There are free wireless hotspots throughout Korea, including government offices, restaurants, bus stops, subways, buses, department stores, libraries, schools, hospitals, etc. As of 2018, Korea had the world's highest internet access rate per household at 99.5% (including wired and wireless), followed by Iceland (99.2%), the Netherlands (98.0%), Norway (96.0%), the United Kingdom (94.8%) and Germany (94.4%), followed by Finland (94.3%) [12]. The proliferation of free Wi-Fi zones in Korea made it attractive for content selection.

As personal computer programming skills become increasingly important in the modern world, Entry guides elementary, middle and high school students to start coding, not just for fun. Instead, by cultivating their interest, Entry eventually gives students a solid foundation in coding. It can be called a new basic AI tool.

4. Possibility of Linking Coding Education and Life Skills Programs

However, Entry's most significant advantage is that it is a free web-based platform that economically disadvantaged students can use. The dictionary defines coding as signifying something or designing a program using a specific programming language. Coding is a technology that implements an abstract algorithm as a motion of a specific object using a programming language. Coding can form the basis of programs such as games, apps, and vaccines. In other words, by engaging in programming activities, one can create games and implement robotic movements, and these activities can improve thinking and logic [13,14].

Therefore, coding education is included in the official curriculum in many countries worldwide, and it has been a regular course in Korea since 2018. Coding education promotes logical and creative thinking, and in the future, it could be one of the core competencies helping people lead independent lives. Advanced research has demonstrated coding's positive effects, including improving logical thinking, self-directed learning, problem-solving, creative thinking, cooperation, and empathy [14]. Various studies have been conducted on how SW education and Entry-based block coding activities affect students' creativity and achievement level. Studies have confirmed that entry-level programming classes using software education material for high school students positively affect metacognition, which plays a vital role in students' creative problem-solving ability. Besides, these studies confirmed that coding education enhances students' self-efficacy [13].

Elementary school students prefer hands-on learning using their bodies to theoretical learning. Thus, they may be interested in making a game and simplifying it, and they can correct misconceptions related to the program while giving and receiving feedback. A striking characteristic of students is that they can enjoy working. Students gradually develop their professionalism and feel a sense of accomplishment by enjoying their work [15]. The optimal state is when an individual's skills and abilities are balanced with challenges and tasks. Subjective satisfaction and happiness felt while maximizing one's potential while performing a task can be called a 'flow'. Through immersion in work, one experiences both joy and competence. The sense of self-efficacy acquired at this time will become an asset in challenging and overcoming complex tasks until adulthood. The many assets that can be gained through computing, thinking and other activities include self-efficacy, problem-solving skills, collaboration, communication, confidence, critical thinking, empathy, etc. [13]. Together, these can become life skills. If computing activities are organized into systematic education programs, there is a possibility that they could be linked to life skills education.

Various types of coding education need to be considered before curriculum related to AI basics can be reflected in textbooks and systematically settled. The competencies that can be obtained through education related to coding can lead to improved life skills necessary for students to live as productive members of society [14]. Elementary school students are often immersed in games. There are times when the people around you cannot hear who you are talking to, forget about the concept of time and space, and even miss a meal. According to previous studies, in order to satisfy the condition of immersion, five principles of goal setting, expectation, interest, self-determination, and challenge must be preceded [15,16]. The Entry platform provides a visual environment to motivate students to set goals, expect success, and induce interest in achieving internal and external goals. Also, it encourages self-determination in achieving the goal while participating in the program [17]. The challenge of progressing to a higher level is goal-oriented rather than competition-oriented, so I chose it as a basic program for improving life skills [18].

5. Life Skills Program Factors

Life skills can be defined as skills that would be useful at any time in an individual's life. Life skills education aims to develop the communication skills, self-assertion skills, decision-making skills, problem-solving skills, abuse defense skills, and creative thinking skills necessary to cope with the dangers encountered in life [19]. UNICEF defines life skills as the ability to adapt effectively to meet the needs and challenges of everyday life and the ability to act positively [20]. Elementary school is a period of rapid emotional and physical growth. People define who they are, their likes and dislikes, and how others see themselves and are more concerned about themselves and their surroundings. Therefore, it is believed that this period is an appropriate time to acquire life skills based on various experiences. In adolescence, more than at any other time, many students struggle with interpersonal relationships and may lack the skills to make decisions or listen to others [19,20].

Suppose students learn and utilize the various life skills necessary for daily life, such as communicating with others, resisting peer pressure, refusing drugs and alcohol, cooperating with others, and being considerate. In that case, those skills will become not only lifelong assets but also help them live a happy life [21]. In the short term, life skills prevent health risks so that individuals can achieve their goals successfully. In the long run, life skills contribute to securing a job and living as a productive member of society. In particular, schools increasingly emphasize the need for life skills because schools are no longer a safe zone due to bullying [22], school violence, and suicide. There are many programs and methods for acquiring life skills, but until now, they have primarily been developed in the field of physical activity and physical education [22].

Looking at the life skills factors suggested by WHO, the core elements of life skills are divided into self-awareness, empathy, interpersonal relationships, communication, critical thinking, creative thinking, decision making, problem-solving, coping with stress, and

coping with emotions [19]. UNICEF reported that an educational approach based on life skills effectively solves health problems such as smoking and drugs in adolescents [20]. The World Health Organization is encouraging life skills education through schools because life skills education improves adolescents' health [19]. According to foreign studies, positive studies show that it effectively improves academic performance, improves the relationship between students and parents, and prevents drug misuse and abuse [23]. For example, in the US, focusing on the Life Skill Training Centre, the Life Skills Program is being implemented simultaneously online and offline for elementary school students, middle school students, high school students, teachers, and parents in each state.

With the expansion of online services due to the 2020 COVID-19 pandemic, contactless digital transformation has accelerated across the planet, including politics, economy, society, culture, education, and industry. Moreover, school learning has been transformed. Depending on how the Coronavirus spread, elementary, middle, and high school classes were often held remotely [24]. For this reason, there was a period when educational programs allowing students to learn independently at home were urgently needed. After their parents went to work, students had more time to study alone with their teacher online. Thus students required skills necessary for leading their own lives. In proportion to the importance of contactless learning, life education programs such as life skills became more necessary. Life skills education is being developed through various programs in every country, but few studies exist on computer coding activities. In this study, three conditions had to be met when developing a life skills program. First, it should conform to the learning characteristics of a contactless program that could be fully accomplished independently using a simple manual. Second, it should be a free platform that anyone could access from home at any time. Third, users could share their work with others and upload it to the web. The Entry platform met all of these conditions.

6. Program Development Process

The research procedures were primarily divided into five steps. In the first step, a literature review was conducted to confirm the factors that constitute life skills. In general, it has been shown that life skills can be acquired through various activities. However, up to now, life skills have been cultivated mainly through sports [24]. In the second step, I introduced the Entry program, identifying its pros and cons. While doing various activities, we investigated the points that students might find difficult, what they needed to learn more deeply, and what knowledge they needed to acquire before starting the Entry program. In addition, we identified improvements that could be raised in the program execution stage. Methods to supplement the program's deficiencies were reflected in the program development stage. The third step was to set the program format and main topics. The opinions of curriculum experts were reflected, confirming the backward curriculum fit the life skills program's characteristics [25]. Next, in the program development stage, the Entry program's subject was aligned with the program detailed above. A simulation (mock class) and two modifications were used to develop the program. The last step was verifying the developed program. After completing two to eight weeks of contactless online class activities, life skills were measured. It was judged that a more sophisticated verification method would be to check the program's effects according to the number of participants and sessions by subdividing the group rather than simply checking the difference between the pre-and-post group after running all the programs. Therefore, the population was divided into four groups. After running the program for two weeks, four weeks, six weeks, and eight weeks, respectively, the difference in life skills was confirmed. The overall progress of the study consists of five stages, as shown in Figure 2 below. The fourth stage's program development process is shown in more detail in Figure 3 below. The detailed development of the program consists of five stages. In the first stage, the life skills factors that can be acquired through Entry activities were determined. In the second stage, the operation hours and training methods were discussed by participating in block coding using the Entry program. In the third step, the program's model, which is at the core

of the study, was produced under the theoretical framework. In the fourth stage, the program was operated through a mock class for a small number of students. In the final step, modifications were made based on what was learned during the study to compensate for unexpected scenarios, such as difficulty solving problems online, time delays, and insufficient feedback. These modifications were reflected in the final program.

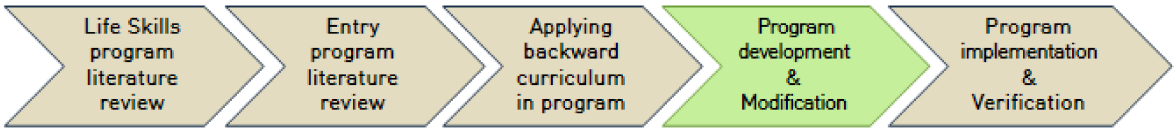


Figure 2. The overall series of research procedure.

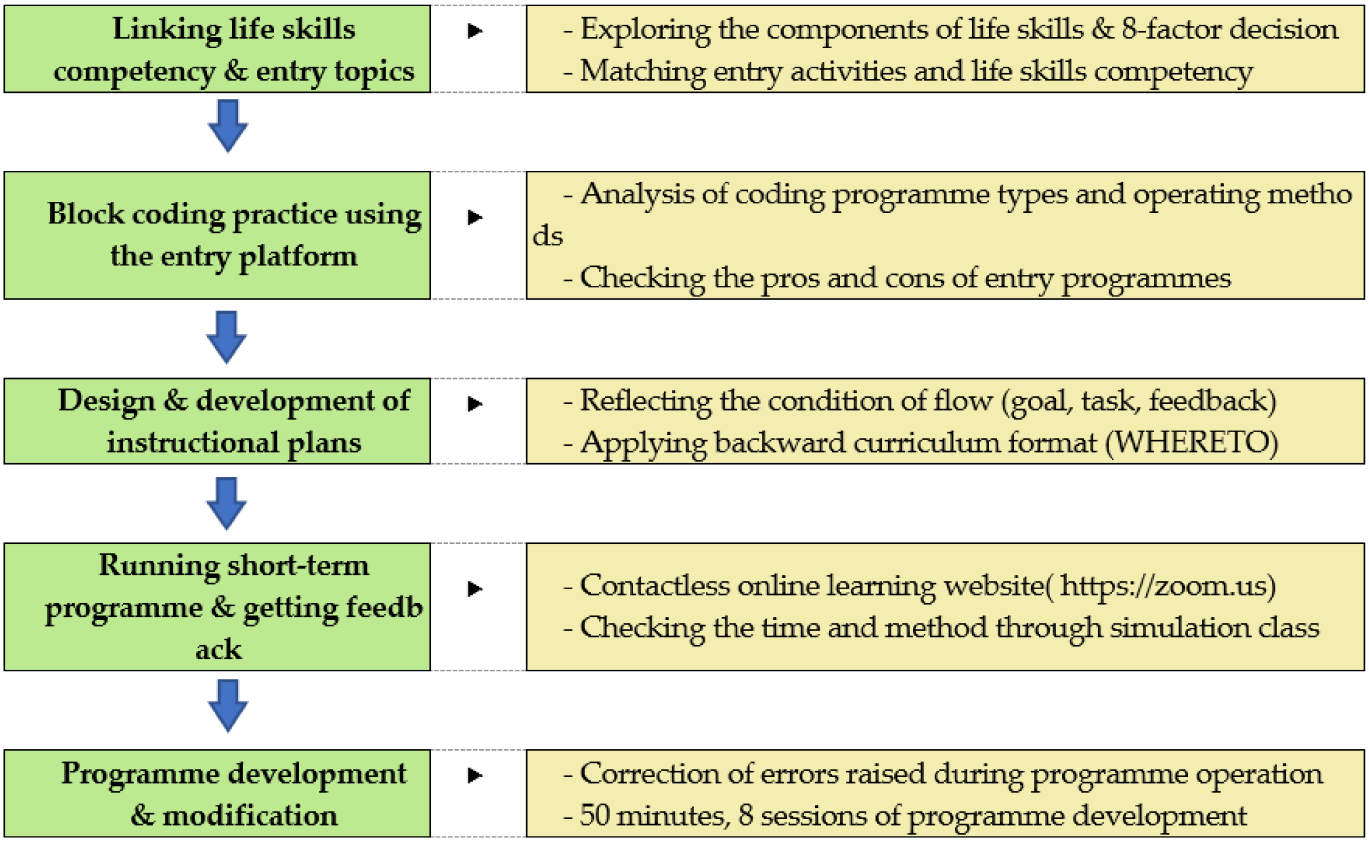


Figure 3. Life skills program development steps.

7. Summary of the 8-Session Program

Subjects were presented in order of difficulty during the eight-week Entry program. In other words, to prevent new students from experiencing problems upon beginning the Entry program, they could start with simple learning before progressing to the complicated game production sequence. In the first step, students had time to get to know and experience the Entry program and learn the meaning of block coding. In the second step, students had time to create their own stories using bubble talk. From the third class, students were guided to construct a straightforward linear motion object.

Additionally, students were asked to choose various screen backgrounds centering on block coding and practice block command by selecting and moving an object. The fourth week was guided so that two or more objects were appearing in the background. There were linear motions and repetitive motions, collisions and disappearances of moving objects mixed in the reverse direction, and motions that incorporated the effects of music and speech bubbles. The spatial concept of repetition and stop, touch, and four directional

walls, including conditional language blocks, is important for these movements. This activity involves high-level block coding such as infinite repetition, random replication, and movement of east, west, north, and south coordinates. In the seventh session, they made a video of their own story using cartoons to receive friends' feedback. The final session's work did not end as a simple result. Instead, it could be linked to economic value by having students create a competitive game. In other words, when uploading their work to an open platform to determine whether it was marketable, students had time to explore the possibility of generating economic profits by participating with multiple people. These programs' superficial appearance may give the impression of simply making games, but behind them are various activities to promote life skills. In other words, they engage in activities that reinforce the core factors of life skills, such as solving problems creatively, empathizing with other people's work, and sometimes cooperating on one task while learning games, producing, and giving or receiving feedback. Eight teachers at each school conducted the program for two to eight weeks, and the program's per session duration was one week. Each teacher trained 30–50 students, and one session lasted 50 min. In addition, the researcher trained the participating teachers on the Entry program's operation and method before starting the study. Figure 4 below shows the core competencies of life skills according to the program's title for a total of eight sessions.

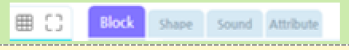
T: Learning Topic & Learning activity **M: Access route or instruction manual**	**C: Life Skills Competency** **Q: Core Questions & A: Assessment Method**
T1: Hello, Entry? & I can access the entry.	C: Critical think-ing, Self-awareness
M: 'entry' in the portal→Click to 'learn.' Entry first steps for starters	Q: Can you access the entry site? A: Whether to perform mission using blockbox.
T2: Adding an object & Create a talk bubble!	C: Empathy, Communication
M: Block-Looks-Write in, say block- Move right. 	Q: Can you make a talk bubble? A: Whether to create a cartoon scene
T3: Catch zombies & Making a flying game.	C: Problem-solving, Creative thinking.
M: Using repeat infinity, clone block. 	Q: Can you code to make one object move? A: Whether conditional code can be used.
T4: Creating objects that move in a straight line	C: Interpersonal relationship, Critical thinking
M: Creating moving objects using conditional, infinite repeat, and clone blocks.	Q: Can you make moving objects? A: Whether the object performs linear motion.
T5: Adding various backgrounds & object.	C: Self-awareness, Creative thinking
M: Adding sounds, backgrounds & objects using the search function.	Q: Can you add more than two objects? A: Whether the object performs linear motion.
T6: Create objects that move in reverse.	C: Communication, Decision making
M: Collaborate with friends to create cooperative works.	Q: Did you create a cooperative work? A: Whether the co-op works properly.
T7: Tell your own story	C: Interpersonal relationship, Empathy
M: Expressing one's story using objects and talk balloons.	Q: Can you make your own picture book? A: Whether you have created your own book.
T8: Olympic games	C: Coping with stress, Coping with emotions
M: Create a competitive game using timers and sound effects.	Q: Can you make a competitive game? A: Whether timers and sound effects are used.

Figure 4. Summary of the eight session program.

8. Program Format and Example

The life skill program's design method and content structure using the Entry program's contents are based on the 'flow' theory and the 'backward curriculum'. The program included three conditions necessary for students' flow: the educational goal of the day, the task to expand the scaffold, and feedback that could reflect improvement. In the program's overall flow, a backward design (WHERETO) [26] was applied to prioritize education evaluation and objectives. This design makes it convenient for teachers in the field to teach according to the manual, keeping them from deviating from the educational goal without preparing a separate evaluation when the class is over [25]. Above all, the core question presented in step 1 has the advantage of clarifying students' educational goals by structuring the content and process. Therefore, in consideration of these advantages, it was judged that the evaluation-centered curriculum of Wiggins and McThai was more suitable for the composition of this program than the generally widespread Gane and Bloom's learning method. Therefore, the program's superficial design takes the form of a backward curriculum that prioritizes teachers' availability and the conditions of students' [26].

Backward curriculum design first explores the learning content's key ideas and then selects appropriate topics [27]. Next, classes are designed in the following order: setting learning goals, establishing evaluation plans, and selecting learning experiences so that students can achieve proper understanding. The backward curriculum design model, widely used in schools and teacher training institutions in the United States, reminds teachers of the core evaluation elements of instruction [28]. In other words, it has the advantage of allowing teachers to identify desirable outcomes based on achievement standards so that teachers do not deviate significantly from their responsibilities and coordinate the class process. The reason for this design process is that first, there may be cases where the educational goal may not be reached due to distraction caused by contactless instruction, and the goal-setting necessary for the immersion environment can be naturally linked to the core evaluation factor. Second, because the design process is a three step linear model, it is not too complicated, so teachers can follow the manual well in the field. Third, it is due to the emphasis on various evaluation methods that value individual experiences to cultivate the life skills of students participating in the program.

In summary, this study's life skills program incorporates clear goals, a balance between challenges and abilities, and clear feedback, all components or prerequisites of flow [17]. Also, the program's framework was taken from the backward design method. Backward design is a concept stating teachers should plan their training based on the desired outcome. Backwards curriculum has three stages of design (1. Desired Results: what the students will learn, 2. Assessment Evidence: developing valid assessments, 3. Planning Instruction: planning learning experiences and instruction). WHERETO (Where, Hook, Explore, Rethink, Exhibit, Teacher's, Organize) encompasses the contents of the main activities the instruction must include as part of the three steps in backward design. Therefore, WHERETO is an acronym that helps design learning activities that support student acquisition, meaning-making, transfer, and feedback [27]. Figure 5 shows the backward design, and Figure 6 is an example of a life skills program based on the backward design.

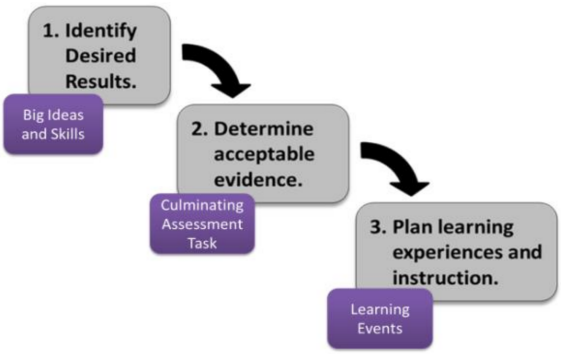


Figure 5. Wiggins, G. P, & McTighe, J. (2005). Understanding by design.

programme Session	T3	Topic	Catch zombies & Making a flying game		
Key questions	Can you code to make one object move?		Life-skills competencies	Problem-solving, Creative thinking	
Learning Objectives	You can create a simple game with two objects and a background.				
Flow	**Backward design**	**Teaching and Learning Strategy**		**Time**	**Note**
goal	W	Can we make a game? ◉ We are going to make a simple game today. - Do you remember making a talk bubble last time? - manual: Block-Looks-Write in say block- Move right. - Today, we are going to create our own moving game.		2′	▶ Key questions ▶ Where?
Task	H	◉ Playing "who I am" Games. - The teacher first tells you how to play. - Encourage two students to present. - Warm-up: Entry Recommended Mission.		8′	▸ Hook & Relevance
	E	◉ Each student challenged the linear motion. - Think about what kind of game screen to make. - Route: https://playentry.org/- Create - Create Project. - Search and select the desired background and object.		10′	▸ Explore Enable & Equip
	R	◉ Finding the wrong coding by comparing. - Rethink about what kind of game screen to make. - Reflecting improvements and corrections. - Whether you can change the background and objects.		10′	▸ Rethink & Reflect
Feed back	E	◉ Check the coding process yourself. - Check yourself for errors in coding. - Whether you can change the background and objects. - Whether the object performs linear motion.		5′	▸ Exhibit & Evaluate
	T	◉ Share your work with others and get feedback - Share your work with teachers and friends. - Finding the strengths of others and reflecting them. - Selecting today's idea work among several works.		10′	▸ Teacher's detailed feedback
	O	◉ Adding effects and timers to your work. - Can you add sound & timer effect? - Can you make two moving objects? - Upload the overall learning and coding method.		5′	▸ Organize (assignments & uploading learning materials)

Figure 6. Example of life skills program.

9. Materials and Methods

9.1. Study Population and Sampling

The study's population is elementary school grades 5–6 nationwide. Due to the COVID-19 outbreak, Korea conducted its first nationwide contactless classes in March 2020. There were many difficulties in autonomous participation, equipment use, and timekeeping in lower elementary school grades [23]. Considering these contactless classes' trials and

errors, it was judged that this program would only be appropriate for higher grades. Therefore, in this study, a non-probabilistic sampling (purposive sample or judgement sample) reflecting the researcher's intention was used [29]. To determine the program's effectiveness, the population was selected from elementary school students in higher grades nationwide. Therefore, eight elementary schools from four major Korean cities voluntarily participated in the program (Gyeong-gi, In-cheon, Busan, and Gwang-ju) and four rural areas (Gang-won, Chung-cheong, Jeolla, and Gyeon-gsang) were targeted (1 September 2020).

The study's purpose was explained to the homeroom teacher. In addition, the Entry program's pre-education was conducted in a contactless manner for a week to enhance the participating teachers' professionalism. After that, the life skills program developed based on the Entry program was implemented at each school (21 September 2020–23 November 2020). To exclude the pre- and post-test's learning effect and more closely check the programs impact according to each time, the difference in life skills according to the number of participants was attempted. Participating groups each conducted a program for 2 to 8 weeks and measured their life skills.

9.2. Measurement

Students' life skills is this study is dependent variable. LSSS (Life Skills Scale for Sport) is a life skills scale developed to measure the field of sports [30]. All eight factors (Time Management, Team Work, Goal setting, Emotional Skills, Interpersonal Communication, Social Skills, Leadership, Problem Solving, and Decision Making) consist of 47 questions. Each question is composed of a 5-point Likert scale, ranging from 1 point 'not at all' to 5 points 'very much'. As a result of conducting exploratory factor analysis, it was identified as five factors different from the original scale.

This study determined that 47 items were too many for elementary school students, so it was judged that the item response fatigue level was high. Therefore, it was necessary to reduce the number of factors and items. Emotional skills, problem-solving and decision-making, which were not clearly loaded as factors were removed. Also social skills and interpersonal communication, which are redundant factors, were integrated into social skills. In this way, the study was set as a total of five factors, and when deleted, items that increase reliability were found and removed. Cronbach's α value was calculated as the item consistency index. The question's consistency index, Cronbach's α (Leadership = 0.84, Goal setting = 0.81, Time Management = 0.80, Team Work = 0.71, Social Skills = 0.70), appeared in that order, which was relatively acceptable [31]. As a result, the measurement was simplified to 18 questions with three questions per factor and translated into words used by elementary school students in everyday life as much as possible to make it easier to understand when translating the original item. The cumulative variance (%) of five factors was found to be 65.65 in the factor analysis. As the extraction method, the Maximum Likelihood Rotation Method and oblimin rotations were used.

9.3. Data Analyses

Before the analysis of variance, the skewness and kurtosis, which were checked to verify the normality of the population, satisfied all of the criteria (skewness < |2|, kurtosis < |4|). As a result of the normality test, both Kolmogorov–Smirnov and Shapiro–Wilk were satisfied and passed normality ($p > 0.05$) [32]. One-way analysis of variance (ANOVA) was used as an analysis method to verify the mean difference between the four groups. The total number of subjects analyzed was 360 students (Agroup = 82, Bgroup = 90, Cgroup = 96, Dgroup = 92). Of these, there were 164 female students and 196 male students, 149 in the fifth grade and 211 in the sixth grade. The result of *t*-test analysis of life skills according to demographics showed the male average was 3.58, and that of females was 3.41. The fifth grade students' average was 3.45, and that of sixth grade students was 3.53, so there was no statistically significant difference. Group A participated in the Life Skills program for two weeks (two times). Group B participated four times for four weeks. Group

C participated six weeks and six times, and Group D participated eight times for eight weeks. First, when life skills were assumed as one factor without classifying any factors, each group's levels were compared. As a result of the analysis, it was confirmed that the C, D groups were higher than the A, B groups, as shown in Figure 7 below ($p < 0.01$). As shown in Table 1, the mean difference for each group was analyzed for five factors. As a result of testing the difference in life skills according to the number of times participated in the program over eight weeks, there were statistically significant differences between the groups in five factors. As a result of Scheffe's post-hoc test, the higher the frequency of participation in life skills, the higher the life skills score ($p < 0.01$).

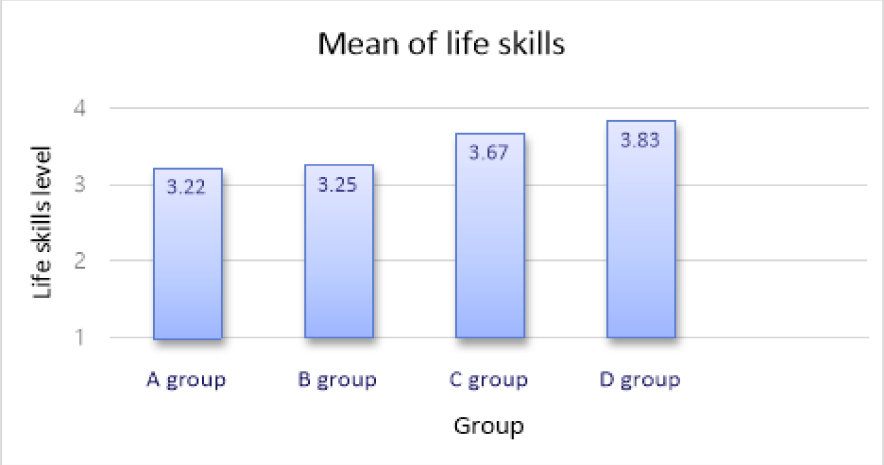


Figure 7. Mean difference of sum of life skills factors by group.

Table 1. Life skills according to the number of program participations.

	A Group (*M*/*SD*)	B Group (*M*/*SD*)	C Group (*M*/*SD*)	D Group (*M*/*SD*)	*F*	Post-Hoc
Leadership	3.12 −0.55	3.15 −0.51	3.41 −0.59	3.58 −0.69	5.70 ***	D > A,B
Goal Setting	3.45 −0.59	3.25 −0.64	3.76 −0.65	4.00 −0.60	19.56 ***	D > A,B C > B
Team Work	3.05 −0.71	3.33 −0.62	3.78 −0.61	3.95 −0.63	19.82 ***	C,D > A,B
Social Skills	3.48 −0.60	3.26 −0.59	3.78 −0.64	4.02 −0.62	19.44 ***	C > B D > A,B
Time Management	3.00 −0.69	3.24 −0.63	3.59 −0.71	3.63 −0.69	5.10 **	D > A,B
Life skills	3.22 −0.63	3.25 −0.60	3.67 −0.64	3.83 −0.65	14.65 ***	C,D > A,B

M = mean, *SD* = standard deviation. ** $p < 0.01$, *** $p < 0.001$.

As shown in the post-hoc analysis results in Table 1 below, the higher the life skills program participation based on the once-a-week entry, the more the groups differed. In other words, the groups that participated six to eight times had higher life skills scores than the groups that participated two to four times. In general, the difference in effect was revealed only after the groups had participated in the program's fourth session of four weeks or longer. The analysis is characterized by the fact that a difference appeared when the life skill program lasted more than four weeks. Therefore, it can be seen that the difference in statistical life skills must be satisfied by at least eight sessions.

10. Discussion

This study aims to develop a program that improves elementary school students' life skills through Entry-based coding activities. Among other activities, you may be

wondering why we chose to study coding. In previous studies, life skills were often taught directly, but recently, there has been an increase in programs that cultivate life skills through various activities [33]. In general, coding education is highly recommended for problem-solving and creativity education. In modern society, where human resources' competitiveness is more important, countries focus on various educational activities by combining coding education with the regular curriculum [34]. This study was undertaken because the competencies acquired through coding education have a common factor in life skills, and many domains [14].

Everything that represents the Fourth Industrial Revolution era, such as artificial intelligence, big data, and the Internet of Things, is implemented through software [1]. Coding education, which is conducted as a part of software education, has the advantage of developing creativity, problem-solving, rational thinking, and career skills [14]. In particular, metacognition, which can be acquired through setting up a strategy and modifying it by participating in coding education, can be the basis of life skill competency. Life skills strengthen resilience skills, enabling students to effectively cope with substance abuse, violence, malnutrition, and other socio-economic and environmental challenges. In addition, its importance was emphasized in that it guarantees the youth's personal and social success and plays a key role in leading a successful life [35].

However, just as there is a phenomenon of cultural retardation that the law cannot keep pace with the speed of culture, program development cannot keep pace with social demands. This may be due to the misconception that life skills is a capability that can be acquired without a program, or it may be because program development experts do not have high expectations for life skill improvement. However, above all, in terms of methodology, there is no diversification of professional knowledge in the program development field, and there is regret that it continues to develop in some sports fields. A study shows that students' life skills level improved through various activities in the life skills intervention program designed for elementary school students. It can be said that these programs, which specialize in life skills competencies, suggest that the effect can be evident in younger students [36]. Looking back at the meaning of life skill, believing it only improves students' life skills, is too narrow of an interpretation. The definition of life skills also includes personal skills and the people who have a relationship with the individual and the individual's surrounding environment. Therefore, the study's implications are not that the Entry-based life skills management program has increased students' level.

The implications and features of this study are as follows. First, life skills programs need to be diversified in relation to future educational trends. In this era of the Fourth Industrial Revolution centered on artificial intelligence, it is necessary to learn and express individual creativity, problem-solving ability, interpersonal relationships, and empathy differently from before. Therefore, it is essential to consider the methodological considerations of mutual sympathy and cooperation by establishing relationships and solving problems in a contactless way rather than using the existing contact program. Entry programs only have value when students cooperate and empathize with others while releasing their creativity freely through a unique task execution method called coding [35]. Therefore, the relationship and cooperation process in the Internet space are emphasized.

Moreover, in order to participate in the contactless education program using Zoom, the habit of managing time is established to practice time management. Eventually, the results of these activities could be linked to economic value, that is, the commercial idea of merchantability. On the other hand, looking at past life skills programs, there were not many cases where life skills improvement was linked to economic value. However, this program is characterized by helping students take a leap toward perfecting their work by evaluating it from the perspective of economical merchandising on an open platform and giving it various feedback. In this part, an appropriate task, a condition of immersion, intervenes [37]. While students' competencies and tasks are balanced, scaffolding is established, and the core life skills competencies grow [38].

Second, this study combined teaching and learning theory with the Entry program. However, more studies are needed to see if synergies are produced when effective teaching and learning theory are combined with life skills programs [17]. This study verified the effect by linking the backward curriculum and immersion theory. The backward curriculum, which presents clear evaluation criteria to make up for the concentration of learning that can be distracted in contactless learning, would have helped the students 'set goals' among their life skills competencies. Third, the flow and content of educational activities provided by the program are centered on the self-competitive structure and 'cooperation and empathy'. Hence, they have a socially friendly character rather than an antisocial one. The programs intended fundamental goal is 'the expression of collaborative creativity'. In the future, it will be challenging to succeed only with creativity. Without cooperating creatively with others, it may be difficult to receive interest and economic sympathy for one's work. Entry games created by individuals will only receive objective compassion when they derive cooperation from others and are recognized for their product's economic value [39]. Fourth, it is necessary to discuss an effective free education program intended to improve life skills. When a free educational program is implemented, various research approaches are needed to see if its effectiveness can be proven. In this study, a free platform was selected in consideration of the student's ability to pay. In fact, life skills may have a more significant impact on the socially underprivileged need than the economically affluent [39]. If life skills can be improved through a free education platform, this could be a financial consideration for economically vulnerable social classes [35]. This is also why this type of free platform-centered convergence education program is needed in the future. Fifth, we learned during the pre-education of teachers while conducting this study that the level of teacher and student program guidance is not very meaningful. In other words, in the case of block coding, it does not mean that because someone is a teacher, they will find the program easy or need less time to learn the program or students will take more time to complete the program or find it more difficult. Therefore, with respect to block coding education, since there is not a large gap between adult and child learning ability, teachers and students can maintain an equal relationship while progressing through the program. Instead, there may be cases where teachers receive feedback from students. This closes the gap between instructors and learners in terms of interpersonal relationships among the life skills competencies. Thus, more active interactions are expected [40]. As mentioned above, the implications and features of the Entry-based life skill program have been listed, but this study has limitations. The study's subject was limited to 5–6 grade years, not all elementary school students. Since it was impossible to perform objective simple random sampling, the researcher's convenience method was used for the sampling method. That is why there is a limit to generalizing the study to the entire elementary school student population.

11. Conclusions

This study aims to develop an Entry-based life skills program, and the hypothesis is whether an Entry-based life skill program is effective. Life skills need to be developed within the broader framework of an environment that includes personal relationships. Therefore, we should not neglect the possibility of using a school's space because we have focused too much on how to improve life skills. This program for elementary school students was developed to emphasize activities that enhance individual creativity, problem-solving skills, and co-operation and empathy within the school environment [41]. As a result of the program operating from two weeks to eight weeks, it was confirmed that the participating students' various life skills improved. However, it has not been confirmed whether this study's results will be applied uniformly throughout countries with distinct cultural environments. From the first to the third session, teachers led the guidance without difficulty. However, when the conditional sentence appeared in the fourth session, the students became difficult. Therefore, it is necessary to create and distribute a simple workbook in advance for use with conditional sentences, which are the core of coding

classes. This study received feedback from participating teachers that practice based on simple theory books was effective because coding classes are the basis of algorithms above all else. It was emphasized that teachers' selective intervention was necessary to reduce the difference in participating students' competency levels.

Teachers working in the school field should consider integrating students' core competencies demanded by the large society into the curriculum through these life skills programs [42]. From the national standpoint, it is necessary to consider a plan to systematically support how life skills' core competencies can develop into human resources. The effect of life skills does not appear in a short period, but it is desirable to form it earlier.

Life skills formed at an early age can be a powerful asset because they help individuals succeed at school, at home, or in different social fields where they live with other neighbors while living in a group [33]. Suppose these assets are cultivated at an early stage. In that case, it would be expected that one could better cope with school violence, bullying, and conflict with friends, which have recently been a problem in countries worldwide. One would also develop a sense of community that warmly embraces society [43]. Therefore, the development of teaching and learning methods for cultivating elementary school students' life skills and research exploring its effects should be pursued for younger age groups. Although research on life skills has been actively conducted in recent years, research on life skills programs for elementary school students is still insufficient.

Considering that life skills are more likely to be internalized and transferred more efficiently, the sooner they are acquired, research targeting elementary school students should be expanded. According to the WHO, there are several ways to improve life skills [19]. There are many things that teachers should do to improve students' life skills, such as the choice and consumption of school meals, integration with the subject class in the classroom, and the formation of a cooperative atmosphere. Among them, the integrated education method with the subject class can be an advantage in the school environment only.

Even if there was no official program called 'Life Skills', perhaps even today, education in schools is related to life skills. Just as various activities are supported to acquire one competency, multiple methods such as physical education, music, reading, computer, storytelling, and mathematics could be used to acquire life skills competencies. In particular, if an activity is related to making or creating games, students' interest and concentration are bound to increase. Therefore, it is expected that more educational programs aimed at improving life skills will be developed on the Internet in the future.

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Informed Consent Statement: All subjects and their parents gave their informed consent for inclusion before they participated in the study.

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