

Article

Investigating the Effects of Career Education Programs on High School Students' Career Development Competencies in Korea

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Abstract: The high school years represent a critical transitional phase during which students navigate career exploration and career decision-making, significantly shaping their lifelong personal development. Policy authorities in Korea have taken proactive measures to strengthen career education within high schools. However, the extent to which students benefit from participating in career education programs remains a subject of debate. Despite increasing interest in career education since the 2000s, empirical studies investigating the causal effects of these programs have been relatively scarce in Korea. The primary aim of this study is to causally estimate the effectiveness of career education programs offered by high schools, and examine how the impact of these activities varies based on the characteristics of participating students, particularly their career plans after high school graduation. To achieve this objective, DID and DDD models were employed, utilizing a balanced panel dataset spanning two years, from the 'Korean Education & Employment Panel II'. The findings of this study revealed the significant positive impact of career education on high school students' career development competencies. Notably, career clubs and career experience programs were identified as effective in enhancing students' career development competencies. Furthermore, the effects of career club and job simulation varied depending on the students' post-graduation plans. These results underscore the importance of optimizing the educational effectiveness of career education by emphasizing students' firsthand experiences and considering individual students' career plans when implementing career education programs.

Keywords: career education; career development competency; difference-in-differences; Korean Education & Employment Panel II



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1. Introduction

The middle and high school years represent a critical transitional phase between career exploration and career decision-making, exerting a significant impact on lifelong personal development [1–3]. In particular, during high school, students actively engage in exploring, preparing, and practicing for their future careers, drawing upon a comprehensive understanding of both themselves and the world of jobs. Thus, career education, which includes exposure and participation to various jobs and practical work experiences, becomes increasingly crucial during the high school stage [4–6].

As the recognition of the value and significance of career education at the high school level has grown, policy authorities have made earnest efforts to strengthen career education within schools. In the Republic of Korea, the introduction of career education in schools can be traced back to the research projects initiated by the Korea Educational Development Institute (KEDI) as a part of the UNESCO initiative in 1982. However, since the 2000s, substantial policy endeavors have been undertaken to bolster career education in the Republic of Korea [7]. With this, numerous researchers have vigorously examined the effect of career education, offering valuable policy implications to enhance its effectiveness [6,8–10].

Despite these efforts, career education still seems burdensome for both teachers and students, often leading to confusion between academic guidance and career support [11,12]. Furthermore, the empirical results dealing with the impact of career education vary depending on the researcher, data utilized, and methodology employed, resulting in a lack of consensus regarding its effectiveness. Estimating the causal effect of career education encounters challenges due to the sample selection bias and endogeneity of estimation results. In particular, the methodologies utilized to assess the effectiveness of career education face limitations in addressing the shortcomings of available data in the Republic of Korea [13,14]. In this respect, this study aims to estimate the causal impact of career education programs using a large-scale panel dataset with representative samples through rigorous causal estimation methods such as DID and DDD. Therefore, the primary objective of this study is to conduct a rigorous empirical examination regarding the effect of career education programs, taking into account the constraints that were evident in prior research endeavors.

In recent years, various career education programs implemented at the high school level tend to focus on developing and providing a wide range of programs in Korea, rather than modifying, supplementing, and improving the quality of programs based on efficacy verification and enhancement [15]. Providing career education programs without verifying their effectiveness not only hampers our ability to adequately address students' educational needs, but also fails to be perceived as an efficient and effective approach, considering limited budget constraints. Therefore, in order to improve the effectiveness, efficiency, and responsiveness of career education in schools, it is crucial to rigorously estimate the effectiveness of such activities at the high school level.

Thus, this study endeavors to estimate the changes in career development competencies resulting from participation in career education programs. Subsequently, this study aims to causally estimate the effectiveness of various career education programs offered by high schools, and examine how the effectiveness of career programs varies based on the characteristics of participating students, particularly their career plans after high school graduation. To accomplish these objectives, we employ the Difference in Differences (DID) method, an approach widely utilized in the social sciences to analyze the treatment effects of specific policies or programs. This research employs career development competency as the dependent variable, a prominent indicator commonly used to evaluate the effectiveness of career education [16]. The research questions align with the study's objectives, and are as follows: (1) What disparities can be observed in the career development competence of high school students based on their participation in career education programs? (2) How does career education affect high school students' career development competency? (3) How does the effect of career education vary based on high school students' career plans following high school graduation?

2. Theoretical Background

2.1. Career Development Competency and Career Education

The concept of career development competency encompasses the knowledge and skills required for individuals to autonomously and rationally select, prepare for, compare, evaluate, and manage various roles and experiences throughout their lives. It represents a fundamental competency essential for an individual's entire lifespan, influencing behavioral changes, values, and attitudes related to their career. Terms such as career maturity and career competency are often used interchangeably with career development competency, with career maturity emphasizing the level of career development achieved, and career competency pertaining to the knowledge, skills, and attitudes necessary for job preparation or further education. In contrast, career development competency emphasizes the intentional and process-oriented aspect of lifelong career development in a self-directed manner [6,14,16,17].

Previous studies focusing on career development competency have primarily focused on sub-competencies related to job understanding, job searching, and decision-making, building upon the aforementioned perspective of career development [18–20]. The Ministry

of Education [4] also identifies four components that constitute career development competency, namely ‘self-understanding and social competency development’, ‘understanding of work and the world of jobs’, ‘career exploration’, and ‘career design and preparation’. Among those four sub-factors, we utilized three components of career development competencies considering the survey questions of the Korean Education & Employment Panel II (KEEP II), which was utilized as the analytical data for the empirical analysis within this study. The competency of ‘understanding of work and the world of jobs’ refers to the ability to comprehend the diversity and dynamic nature of the job market, and engage in self-directed exploration for a future career. The ‘career exploration’ competency indicates the ability to find fitting career and future jobs through exploration and analysis of the career and occupations that individuals find intriguing. Lastly, ‘career design and preparation’ entails the ability to creatively design and implement one’s career path based on the exploration of different career options and occupations [14] (p. 162).

On the other hand, career education programs offered within high schools can be broadly categorized into ‘career psychological tests’, ‘career counseling’, ‘career clubs’, and ‘career experiences’ [13]. ‘Career Psychological Tests’ refer to the activity of conducting psychological assessments related to careers (such as vocational aptitude tests, vocational values assessments, career maturity assessments, and vocational interest tests, etc.) to help students gain an understanding of their aptitude and inclinations, and to utilize the test results as resources in career counseling. ‘Career counseling’ refers to activities that involve providing students with career-related information, guidance, and advice, which may also include online activities provided through online platforms. ‘Career clubs’ refer to small groups or collective activities organized and operated autonomously by students with the goal of achieving common career education objectives. Lastly, ‘career experience’ refers to educational activities designed to assist students in their career choices and career planning by offering direct or indirect experiences that enable them to explore various careers and occupations. Such career experiences can be categorized based on their content and format, such as field job experiences, job simulations, field trips, department experiences, career camps, and career lectures, with specific details provided in Table 1.

Table 1. The contents of career experiences in the Republic of Korea.

Types	Explanation
Field job experience	Activities during which students directly engage in job-related tasks and gain practical experience in workplaces (it is recommended that each mentor oversee approximately 10 students.)
Job simulation	Activities during which students can directly perform and experience tasks in simulated work environments (it is recommended that each mentor oversee approximately 15 students.)
Career field trip	Activities during which students visit workplaces to observe workers in the field and practical job procedures
Department experience	Visits to colleges or graduate schools to provide students with practical experience and basic knowledge
Career camp	Comprehensive career education, which includes various career activities in a specific location for more than 6 h a day
Career lecture	Lectures (or interactive conversations) delivered by corporate CEOs and experts from various fields (to approximately 40 students)

Source: Ministry of Education et al. [21] (p. 2).

Building upon the aforementioned concept of career education and its classification, this study categorizes students’ “career education programs” into nine distinct categories and endeavors to assess the effect of these nine career education programs on high school students’ career development competencies.

2.2. Literature Review

The impact of career education programs can be categorized into short-term and medium-to-long-term outcomes. In terms of the short-term perspective, research on high school career education programs has primarily focused on indicators like high school dropout rates and college enrollment rates [22,23]. Gottfried et al. [22], in a longitudinal study, revealed that high school students who completed career education programs were less likely to drop out of high school and had a higher likelihood of graduation. Furthermore, they empirically demonstrated that the timing of participation in career education programs affects their effectiveness, with later participation being more beneficial. Plank et al. [23] conducted an empirical analysis that examined how the combination of career education programs and the standard school curriculum affected dropout rates. Their analysis demonstrated that integrating career education programs with the regular curriculum led to improved educational outcomes.

Shifting to the long-term perspective, investigations into the efficacy of high school career education programs have delved into labor market outcomes, particularly in terms of wages [24,25]. Bishop et al. [24] conducted a longitudinal study to assess the impact of career education programs within high schools. Their findings indicated that students who completed a sixth of their total credits through career-focused educational programs during high school received approximately 12% higher wages one year after graduation and around 8% higher wages seven years after graduation, compared to the peers who did not participate in career education programs. Additionally, Mane [25] empirically demonstrated a strong association between high school career education programs and wage increases in the labor market. This research underscored that the positive effects of high school career education programs were significantly more prominent among students who did not pursue a 4-year college education.

On the other hand, in the Korean context, research on the influence of career education programs has been examined with two main trends. Firstly, there have been studies that analyze the effects or relationships between students' participation in career education programs and their career development competencies based on empirical analyses. For instance, Lim [9] analyzed the impact of school career education participation on career development self-efficacy, utilizing multilevel modeling with the dataset from the KEEP I survey of high school seniors. The results indicated a significant positive relationship of participation in a career-related curriculum, career-related lectures, school and departmental guidance, and vocational experiences with high school students' career development self-efficacy.

Chu et al. [10] utilized a DID method to estimate the impact of career experiences on middle school students' career maturity, using a stratified random sampling process. The findings revealed the statistically positive effects of career experiences on self-understanding, information exploration, attitudes toward occupations, career planning, and rational decision making.

Jang [6] estimated the relationship between school career education activities and career development competencies among middle school students using OLS estimation with data from the annual survey on career education status offered by the Ministry of Education. The results indicated that participation in career exploration in curriculum classes, career psychological tests, career experiences, and career clubs was associated with significantly higher levels of career development competencies compared to non-participating students.

Kim [13] analyzed the influence of school-based career education activities on the career development competencies of multicultural high school students, as well as the mediating effect of self-efficacy, using data from the first year of the KEEP II survey. The findings indicated that higher satisfaction with career-related curriculum classes and career psychological tests was associated with higher career development competencies among multicultural high school students. Additionally, self-efficacy was found to have a mediating effect on satisfaction with career experiences and career development competencies.

Seongok et al. [14] examined the structural relationship between career education experiences within schools and career development competencies using data from the 2016–2018 annual survey on career education status among high school students. The findings indicated statistically significant positive relationships between participation in school-based career education activities and career development competencies. Furthermore, the study revealed the presence of a mediating effect of self-directed learning.

Park et al. [16] employed a multilevel elastic net model, a type of penalized regression model, using data from the first and fourth years of the KEEP II survey to identify factors influencing the career development competencies of vocational high school students. The findings indicated that participation in career practical experiences, departmental experiences, career-related activities within creative experiential activities, and satisfaction with career education and activities had positive effects on the enhancement of career development competencies, depending on the type of career education and activity.

On the other hand, some studies have analyzed the outcomes of the career education activities of general high schools through qualitative case studies and literature reviews [11,12]. Park [11] critically analyzed the outcomes of high school career education by examining the issues related to the goals, the stakeholders of career education, and the attitudes expected from students. Lee [12] conducted qualitative research to closely examine the realities of career guidance in general high schools, highlighting concerns about career counseling expertise and the conflicts between career education and college entrance guidance. A table summarizing the results of the previous research analyses is presented in the Appendix A.

While preceding studies have made efforts to verify the effectiveness of career education through various approaches, many existing studies, even with cross-sectional or longitudinal data, have limitations in interpreting the results causally due to the short intervals between surveys, which do not allow for the time required for the effects of career education and activities to manifest to be considered. Moreover, methodological considerations regarding selection bias that may occur in the process of determining participation in career education programs are somewhat lacking. For instance, if an analysis model does not adequately account for factors that may influence participation in career education programs, such as individual, household, and school characteristics, the estimated regression coefficients of career education programs derived from such models may include bias. Therefore, in this study, we aim to estimate the causal effects of various career education and activities within schools on high school students' career development competencies using a repeated measurement design with two time points, employing Difference in Differences (DID) and Triple-Difference (DDD) methods, while taking into account the constraints of the existing literature.

3. Materials and Methods

3.1. Materials

This study utilized survey data from the Korea Education and Employment Panel II (KEEP II), conducted by the Korea Research Institute for Vocational Education and Training (KRIVET), to analyze the impact of career education programs on high school students' career development competencies. The KEEP II survey aims to comprehend the educational experiences, progression, career paths, and transition to the workforce of young individuals in the 2010s. For this purpose, KEEP II conducted the first survey in 2016, involving 10,558 second-grade high school students, as well as their parents, teachers, and school administrators from participating schools. In the second-year survey conducted in 2017 for the third-grade high school students, a sample of 9517 students was included for data collection.

For the analysis of this study, a total of 9090 high school students who participated in both the first and second-year surveys were selected as the analysis subjects; thus, we constructed a balanced panel dataset. Additionally, to create a suitable sample for the DID model, which is the analytical approach employed in this study, only students who had not participated in career education programs during the first-year survey were included as

analysis subjects. As a result, there are variations in the number of samples included by analytic models. Hence, in this chapter, the number of samples and subsequent descriptive statistics were presented based on the sample used for analyzing the effectiveness of job simulations, which comprised the largest sample size. Thus, the total number of samples used for the analysis of the effect of job simulation was 15,198 (7599 in the first year, and 7599 in the second year). For reference, the number of samples for the analysis regarding career psychological tests is 3930, 6750 for career counseling, 12,746 for career clubs, 4960 for career lectures, 6956 for field trips, 9958 for department experiences, 12,556 for field job experiences, and 13,354 for career camps, respectively.

3.2. Variables

The objective of this study is to examine the impact of career education programs on high school students' career development competencies using a DID model. For this purpose, a treatment group dummy variable was employed, taking a value of 1 for the group that did not participate in a career education program in the first survey year (2016) of KEEP II, but participated in career education program in the second survey year (2017), and 0 for the group that did not participate in a career education program in both the first and second survey years. Additionally, a year dummy variable was used for DID estimation, taking a value of 0 in the first year and 1 in the second year.

KEEP II addresses the theoretical limitations of career maturity levels in KEEP I, and strengthens its alignment with the Ministry of Education's "School Career Education Goals and Achievement Standards" [4] and "School Career Education Program (SCEP)" by incorporating four questions related to 'understanding work and the world of jobs', and five questions for 'career exploration' and 'career design and preparation' [21]. Therefore, in this study, the average values of the items related to the three components of career development competency in KEEP II were calculated as dependent variables and used for analysis. The reliability of "understanding work and the world of jobs" in the first year was 0.785 and 0.822 in the second year. The reliability of "career exploration" was 0.815 in the first year and 0.806 in the second year. The reliability of "career design and preparation" was 0.848 in the first year and 0.860 in the second year.

To account for the influence of confounding variables on changes in the dependent variables, covariates related to students' career development competencies were included based on previous studies. These covariates encompassed individual characteristics such as self-efficacy, multicultural acceptance, and desired education level [5,13,16,26]. School characteristics included satisfaction with the school environment [16], school life satisfaction, and teacher satisfaction [5]. Family characteristics were represented by variables such as conversations with parents about future jobs [16], family life satisfaction, participation in private tutoring, and household average monthly income (ln). Descriptions and the basic statistics of the variables used in the analysis for each year are presented in Table 2.

Table 2. Definition and descriptive statistics of key variables.

Variable	Description	2nd Grade (Obs. = 7599)		3rd Grade (Obs. = 7599)	
		Mean	S.D	Mean	S.D
Dependent variables	Understanding of work and the world of jobs Mean of 4 items ¹ regarding 'understanding of work and the world of jobs' (5-point Likert scale)	3.312	0.711	3.341	0.693
	Career exploration Mean of 5 items ² regarding 'career exploration' (5-point Likert scale)	3.503	0.664	3.532	0.606
	Career design and preparation Mean of 5 items ³ regarding 'career design and preparation' (5-point Likert scale)	3.603	0.719	3.623	0.635

Table 2. Cont.

Variable	Description	2nd Grade (Obs. = 7599)		3rd Grade (Obs. = 7599)	
		Mean	S.D	Mean	S.D
Treatment variables	Career psychological tests	1 if the respondent participated in career psychological tests only in the 2nd survey year (2017); 0 if the respondent did not participate in career psychological tests in both the 1st and 2nd years	0.769	0.829	
	Career counseling	1 if the respondent participated in career counseling only in the 2nd survey year (2017); 0 if the respondent did not participate in career counseling in both the 1st and 2nd years	0.596	0.791	
	Career clubs	1 if the respondent participated in a career club only in the 2nd survey year (2017); 0 if the respondent did not participate in a career club in both the 1st and 2nd years	0.262	0.311	
	Career lectures	1 if the respondent participated in a career lecture only in the 2nd survey year (2017); 0 if the respondent did not participate in a career lecture in both the 1st and 2nd years	0.696	0.639	
	Career field trips	1 if the respondent participated in a career field trip only in the 2nd survey year (2017); 0 if the respondent did not participate in a career field trip in both the 1st and 2nd years	0.494	0.480	
	Department experience	1 if the respondent participated in department experience only in the 2nd survey year (2017); 0 if the respondent did not participate in department experience in both the 1st and 2nd years	0.381	0.384	
	Field job experience	1 if the respondent participated in field job experience only in the 2nd survey year (2017); 0 if the respondent did not participate in field job experience in both the 1st and 2nd years	0.196	0.262	
	Job simulation	1 if the respondent participated in job simulation only in the 2nd survey year (2017); 0 if the respondent did not participate in job simulation in both the 1st and 2nd years	0.000	0.174	
Control variables	Career camps	1 if the respondent participated in a career camp only in the 2nd survey year (2017); 0 if the respondent did not participate in a career camp in both the 1st and 2nd years	0.200	0.224	
	Self-efficacy	Mean of 5 items ⁴ regarding self-efficacy (5-point Likert scale)	3.630	0.670	3.641 0.657
	Multicultural acceptance	'I can accept classmates from diverse cultural backgrounds' (5-point Likert scale)	4.093	0.809	4.094 0.747

Table 2. Cont.

Variable	Description	2nd Grade (Obs. = 7599)		3rd Grade (Obs. = 7599)	
		Mean	S.D	Mean	S.D
Desired education level	High school: 1; 2–3 years college: 2; 4–6 years at university: 3; Master’s degree: 4; doctoral degree: 5	2.771	1.013	2.645	0.979
Conversation with parents about future jobs	Not at all: 1; once a month: 2; 1–2 times a week: 3, 3–4 times a week: 4, almost everyday: 5	2.837	1.059	2.921	1.137
Satisfaction with school environment	‘The environment around school is clean and neat’ (5-point Likert scale)	3.660	0.878	3.775	0.843
School life satisfaction	‘I am satisfied with current school life’ (5-point Likert scale)	3.643	0.861	3.837	0.786
Teacher satisfaction	Mean of 4 items ⁵ regarding teacher satisfaction (5-point Likert scale)	3.807	0.729	3.853	0.767
Private tutoring	1 if the respondent participated in private tutoring; otherwise, 0	0.692		0.593	
Satisfaction with family life	‘I am satisfied with my current family life’ (5-point Likert scale)	4.087	0.883	4.055	0.833

¹ The items are as follows: ① I know examples of individuals who have pioneered new careers or professions. ② I possess knowledge regarding how the world of work and professions has evolved over time. ③ I can explain the professional ethics required in my desired jobs. ④ I can explain biases and stereotypes commonly associated with professions prevalent in our society. The reliability coefficients in the first and second years were 0.785 and 0.822, respectively. ² The items are as follows: ① I can explain various types of higher education institutions available after high school graduation. ② I can explore information about the university or major I desire through various methods. ③ I can explore information about my desired career through various methods. ④ I can differentiate between reliable and unreliable information among various career-related sources. ⑤ I know the educational requirements and qualifications needed for my desired profession. The reliability coefficients in the first and second years were 0.815 and 0.806, respectively. ³ The items are as follows: ① I can develop a long-term career plan taking into account my characteristics and environment. ② I have a plan for post-high school. ③ I know how to prepare for my desired career. ④ I have criteria that I consider important when choosing a career. ⑤ I can overcome challenges that arise while preparing for my career. The reliability coefficients in the first and second years were 0.848 and 0.860, respectively. ⁴ The items are as follows: ① I know what I am good at. ② I am aware of the things I enjoy doing. ③ I know what is important in my life. ④ I make decisions without difficulty when I need to. ⑤ I am capable of executing my plans effectively. The reliability coefficient in the first and second years were 0.827 and 0.852, respectively. ⁵ The items are as follows: ① I like my teacher. ② I respect my teacher. ③ My teacher understands me. ④ My teacher shows interest in my career and aptitude. The reliability coefficients in the first and second years were 0.893 and 0.916, respectively.

3.3. Analytic Methods

In order to empirically investigate the effects of career education programs, this study employed a DID method. The DID method applies the concept of an experimental group and a control group commonly used in experimental research. DID is a research method that analyzes the implementation effect of a program or policy in social sciences. It involves repeated observation data from two or more time points for both the treatment and control groups. At the reference point (T_0), neither group is subject to the program, but after treatment, only the treatment group is subjected to the program at the post-treatment time point (T_1). DID aims to estimate the net marginal effect of the program by comparing the amount of change in the dependent variable between the two time points of the treatment group and the control group. Essentially, it allows us to interpret the pure marginal effect of treatment variables, considering individual and time characteristics [27]. The advantage of utilizing DID is that it is relatively free from omitted variable bias. The estimated regression function for DID estimation can be represented as follows:

$$\text{Model (1)} \quad Y = \beta_0 + \beta_1 T + \beta_2 D + \beta_3 (T \times D) + \varepsilon$$

In the analytical Model (1), Y is the dependent variable indicating the career development competency. The treatment group is represented by a dummy variable (T) with a value of 1 if a student belongs to the treatment group, and 0 if not. Similarly, a time dummy variable (D) is used, taking a value of 1 at the second time point and 0 at the first time point. The interaction term of the two variables is denoted as $(T \times D)$. The model also includes an error term to account for unexplained variability. The expected value of the dependent variable by year can be expressed as follows within this analytic model.

- ① 1st year of treatment group: $\beta_0 + \beta_1$
- ② 2nd year of treatment group: $\beta_0 + \beta_1 + \beta_2 + \beta_3$
- ③ 1st year of control group: β_0
- ④ 2nd year of control group: $\beta_0 + \beta_2$

The DID estimator of the analysis model (1) calculates the difference between the change observed in the treatment group ($\beta_2 + \beta_3$) and the change in the control group (β_2). This estimation result aligns with the coefficient of the interaction term between the treatment group and time dummy variables (β_3).

However, it is crucial to acknowledge that changes in the dependent variable might not solely be attributed to policy or program interventions; they could also be influenced by other characteristics. To address this issue, it becomes essential to control for changes in these confounding variables. Introducing covariates into the model allows for the control of dependent variable changes resulting from variations in the covariates, and it simultaneously provides a more precise standard error [28].

Therefore, this study aims to obtain a more robust DID estimate by conducting an additional analysis using the Model (2), which includes the incorporation of the following covariates. In the Model (2), similar to Model (1), the DID estimate of career education programs can be determined through the regression coefficient of the interaction term between the treatment group dummy and time dummy variables (β_3).

$$\text{Model (2)} \quad Y = \beta_0 + \beta_1 T + \beta_2 D + \beta_3 (T \times D) + \sum \delta X + \varepsilon$$

However, there is a possibility that the aforementioned DID estimate might not accurately represent the true policy effect. It is crucial to consider the presence of other effects, as the DID estimation can lead to an overestimation of the treatment effect. This means that even in the absence of treatment, a difference between the treatment group and the control group can be assumed to exist [28].

Notably, the participation of high school students in career education programs in Korea is closely linked to their own and their parents' anticipated academic abilities and career plans [9,29]. Furthermore, the effects of career education programs may manifest differently between students who plan to attend college after high school graduation and students who plan to enter the job market [30]. Therefore, this study seeks to examine the variation in the effects of career education programs between these two groups (college-bound and job-bound students) to ensure the robustness of the DID estimator.

To achieve this, this study employs a Difference-in-Difference-in-Differences (DDD) model, represented as analysis Model (3) below. The DDD estimate of career education programs can be ascertained through the regression coefficient of the triple interaction term (β_7) between a treatment group dummy variable (T), a time dummy variable (D), and the college entrance plan dummy variable (G), with a value of 1 if a student plans to enter college after high school graduation, and 0 if not.

$$\text{Model (3)} \quad Y = \beta_0 + \beta_1 T + \beta_2 D + \beta_3 (G) + \beta_4 (T \times D) + \beta_5 (T \times G) + \beta_6 (G \times D) + \beta_7 (T \times D \times G) + \sum \delta X + \varepsilon$$

4. Results

4.1. Changes in Career Development Competencies through Career Education Program Participation

In this study, we utilized a DID method based on the analysis Model (1) to estimate the changes in career development competencies through participation in career education programs. The results are presented in Table 3.

Table 3. Changes in career development competencies through participation in career education.

	Understanding of Work and the World of Jobs	Career Exploration	Career Design and Preparation
Year × Career psychological tests	0.013 (0.050)	0.053 (0.046)	0.112 ** (0.048)
Year × Career counseling	0.048 (0.039)	0.072 ** (0.035)	0.047 (0.038)
Year × Career clubs	0.165 *** (0.028)	0.060 ** (0.026)	0.042 (0.028)
Year × Career lectures	0.077 * (0.040)	0.059 (0.036)	0.051 (0.039)
Year × Career field trips	0.089 *** (0.033)	0.049 * (0.030)	0.029 (0.032)
Year × Department experience	0.090 *** (0.031)	0.040 (0.028)	0.030 (0.030)
Year × Field job experience	0.158 *** (0.030)	0.073 *** (0.027)	0.028 (0.029)
Year × Job simulation	0.163 *** (0.030)	0.046 * (0.028)	0.034 (0.029)
Year × Career camps	0.143 *** (0.031)	0.066 ** (0.029)	0.021 (0.031)

Note: Dependent variables are ‘Understanding of work and the world of jobs’, ‘Career exploration’, and ‘Career design and preparation’. Considering the objective of this study in verifying the effectiveness of career education and the limited number of pages, the results table includes only the regression coefficients and standard errors of the Difference-in-Differences (DID) estimates. Standard errors are in parentheses. Significant levels are *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The results of this study indicated a significant relationship between participation in six types of career experience programs (career lectures, career field trips, department experience, field job experience, job simulation, and career camps) and improvement in ‘Understanding of work and the world of jobs’ among high school students. Specifically, high school students who engaged in career clubs (0.17 points), received special lectures from vocational mentors (0.08 points), attended field trips (0.09 points), took part in department experiences (0.09 points), undertook field job experiences (0.16 points), participated in job simulations (0.16 points), and attended career camps (0.14 points) demonstrated heightened levels of ‘understanding work and the world of jobs’ in comparison to those who did not participate in these career experience programs (measured on a 5-point scale).

Additionally, among the sub-factors within the career development competency construct, ‘career exploration’ has been found to be associated with participation in career counseling, career clubs, career field trips, field job experiences, job simulations, and career camps. In other words, high school students who received career counseling (0.07 points), were part of career clubs (0.06 points), went on field trips (0.05 points), had field job experiences (0.07 points), engaged in job experiences (0.05 points), and attended career camps (0.07 points) exhibited higher levels of career exploration competencies compared to students who did not participate in those programs.

On the other hand, engagement in career psychological tests displayed a positive association with high school students' 'career design and preparation'. Specifically, high school students who underwent career psychological assessments (0.11 points) demonstrated elevated levels of career planning and readiness when compared to their counterparts who did not participate in such tests.

These findings imply a favorable relationship between engagement in diverse career education programs and the enhancement of students' career development competencies. Notably, among the various career education programs aimed at high school students, the effectiveness of career clubs and career experiences stands out. Given that both career clubs and career experiences emphasize firsthand engagement and exposure for students [4,13], this underscores the importance of developing and implementing career education programs that provide students with direct opportunities for experiential learning and skill development.

4.2. The Effects of Career Education Programs on Career Development Competency

To rigorously examine the effects of career education programs, this study employed a DID method based on the analysis Model (2), where covariates representing student, school, and household characteristics were incorporated. The findings of this analysis are presented in Table 4.

Table 4. Effects of career education program on career development competencies.

	Understanding of Work and the World of Jobs	Career Exploration	Career Design and Preparation
Year × Career psychological tests	−0.056 (0.048)	0.004 (0.043)	0.009 (0.043)
Year × Career counseling	−0.008 (0.036)	0.021 (0.032)	−0.009 (0.033)
Year × Career clubs	0.153 *** (0.026)	0.058 ** (0.023)	0.032 (0.024)
Year × Career lectures	0.020 (0.038)	0.019 (0.033)	−0.014 (0.034)
Year × Career field trips	0.045 (0.031)	0.026 (0.027)	0.000 (0.028)
Year × Department experience	0.039 (0.029)	0.006 (0.025)	−0.020 (0.026)
Year × Field job experience	0.157 *** (0.028)	0.067 *** (0.025)	0.011 (0.026)
Year × Job simulation	0.150 *** (0.029)	0.040 (0.025)	0.014 (0.026)
Year × Career camps	0.131 *** (0.030)	0.071 *** (0.026)	−0.000 (0.026)

Note: The models include various control variables such as self-efficacy, multicultural acceptance, desired educational level, conversation with parents about future jobs, satisfaction with school environment, school life satisfaction, teacher satisfaction, private tutoring, and satisfaction with family life. Considering the objective of this study in verifying the effectiveness of career education the limited number of pages, the results table includes only the regression coefficients and standard errors of the Difference-in-Differences (DID) estimates of career education programs. Standard errors are in parentheses. Significant levels are *** $p < 0.01$, ** $p < 0.05$.

The application of the DID method, while controlling for covariates, yielded notable variations in the findings compared to the previous outcomes presented in Table 3. Notably, when accounting for the influence of confounding variables related to student, school, and family characteristics, career psychological tests, career counseling, career lectures, career field trips, and departmental experiences were no longer found to be effective in augmenting high school students' career development competencies.

Nevertheless, even after adjusting for these covariates, it was discerned that engagement in career clubs, field job experience, job simulation, and career camps had a positive impact on students' career competencies. Specifically, participation in career clubs demonstrated effectiveness in enhancing students' 'understanding of work and the world of jobs' (0.15 points) and 'career exploration' (0.06 points), while field job experiences were associated with improved 'understanding of work and the world of jobs' (0.16 points) and 'career exploration' (0.07 points). Job simulations were effective in elevating 'understanding of work and the world of jobs' (0.15 points), and career camps had a positive influence on 'understanding of work and the world of jobs' (0.13 points) and 'career exploration' (0.07 points).

The above analysis results highlight that career clubs and experiential career programs emphasizing hands-on learning maintain their positive effects even when covariates are considered. In contrast, traditional career education programs such as career lectures, career psychological tests, career counseling, and career field trips did not exhibit significant associations with students' career development competencies.

Hence, it becomes evident that a comprehensive examination and improvement of the content and delivery methods of current career education programs are warranted. Furthermore, given the analysis results indicating a lack of effectiveness in terms of 'career design and preparation' for high school students, it is imperative to emphasize the development of specialized and tailored career education programs to cultivate the requisite competencies.

4.3. Sensitivity Analysis Regarding the Effects of Career Education Programs

This study aimed to validate the sensitivity of DID estimates by investigating potential variations in the effects of career education programs based on students' career plans after high school graduation. Specifically, this study explored whether there are differences in effects of career education programs between students planning to attend college and those planning to enter the job market after high school graduation. To accomplish this goal, the study employed the Difference-in-Difference-in-Differences (DDD) analysis method, as presented in the analysis Model (3), to examine the impact of career education programs on enhancing career development competency for both groups. The results of these analyses can be found in Table 5.

In Table 5, the interaction terms among the year dummy variable, treatment group dummy variable, and college enrollment plans dummy variable were examined to estimate the differences in the effects of career education programs based on post-graduation career plans (college enrollment vs. entrepreneurship). Based on the findings, notable differences were observed in the effects of career club and job simulation between the group of students planning to attend college and the group intending to enter the job market. Specifically, compared to the group planning to pursue higher education, the group planning to get a job after high school graduation showed greater improvement in competencies related to 'understanding of work and the world of jobs' (0.11 points) and 'career design and preparation' (0.10 points) through participation in career clubs. On the other hand, the group planning to attend college exhibited more significant progress in the competency of 'career exploration' (0.10 points) compared to the group planning to get a job after high school graduation, through participation in job simulation.

These results from the DDD analysis provide further confirmation of the effectiveness of career clubs and career experiential programs in enhancing career development competencies. However, it's important to note that the DDD analysis results pertain specifically to the differences in the effectiveness of career education and activities between students planning for college enrollment and those planning for employment or entrepreneurship after high school graduation. Therefore, there are limitations to using these results alone to assess the overall effectiveness of career education. Nevertheless, considering the statistically significant effects of career clubs and job-related practical experiences revealed by the DDD estimation, it is evident that ongoing efforts should be made to support the enhancement of students' career development competencies through these programs.

Table 5. Differences in the effects of career education on career development competencies.

	Understanding of Work and the World of Jobs	Career Exploration	Career Design and Preparation
Year × Career psychological tests × college plan after high school	0.077 (0.112)	−0.035 (0.096)	0.011 (0.095)
Year × Career counseling × college plan after high school	−0.001 (0.085)	−0.050 (0.078)	0.021 (0.078)
Year × Career clubs × college plan after high school	−0.108 * (0.060)	−0.018 (0.053)	−0.096 * (0.052)
Year × Career lectures × college plan after high school	−0.092 (0.094)	−0.052 (0.085)	0.040 (0.085)
Year × Career field trips × college plan after high school	−0.034 (0.083)	−0.103 (0.076)	0.033 (0.077)
Year × Department experience × college plan after high school	−0.034 (0.060)	−0.070 (0.061)	−0.039 (0.062)
Year × Field job experience × college plan after high school	0.026 (0.065)	0.069 (0.058)	0.021 (0.059)
Year × Job simulation × college plan after high school	0.051 (0.065)	0.095 * (0.057)	−0.022 (0.058)
Year × Career camps × college plan after high school	−0.106 (0.068)	−0.009 (0.060)	0.017 (0.061)

Note: The models include various control variables, such as self-efficacy, multicultural acceptance, desired educational level, conversation with parents about future jobs, satisfaction with school environment, school life satisfaction, teacher satisfaction, private tutoring, satisfaction with family life. Considering the objective of this study in verifying the effectiveness of career education and the limited number of pages, the result table includes only the regression coefficients and standard errors of the Difference-in-Difference-in-Differences (DDD) estimates of career education programs. Standard errors are in parentheses. Significant levels are * $p < 0.1$.

5. Discussion and Conclusions

This study empirically analyzed the effects of career education programs on high school students' career development competencies utilizing datasets from the 1st and 2nd years of the KEEP II. Specifically, the study focused on three dependent variables representing sub-factors of career development competency: 'understanding of work and the world of jobs', 'career exploration', and 'career design and preparation.' Additionally, nine variables related to career education programs were set as treatment variables, including 'career psychological tests', 'career counseling', 'career clubs', and 'career experiences', which consists of career lectures, career field trips, department experience, field job experience, job simulation, and career camps. After controlling for individual, school, and family characteristics, this study employed a Difference-in-Differences (DID) model and a Difference-in-Difference-in-Differences (DDD) model to conduct an empirical analysis of the effect of career education programs.

The key findings from the empirical analysis are as follows. Firstly, the effectiveness of career clubs and career experience programs among various career education programs for high school students was identified. Students who participated in career clubs and career experiences (especially field job experiences, job simulations, and career camp) demonstrated higher levels of career development competencies even after controlling for the influence of covariates, compared to students who did not participate in these programs. Considering that both career clubs and career experience are experiential career education activities, it can be inferred that it is necessary to design, implement, and expand these experiential career education programs by allowing students to directly experience and participate in the world of jobs and occupations to improve students' career development competencies. According to a survey conducted by Kim et al. [31] on the current status of career education in Korean elementary and middle schools in 2021, satisfaction with career clubs and career experience among Korean high school students was high, with

scores of 3.81 and 3.78 (out of 5 points), respectively. Particularly for career experiences, 85.9% of students expressed their desire to participate in such activities in the future, indicating a high demand for these career education programs. Despite these results, the participation rates in career club and career experience among Korean high school students were relatively low at 53.5% and 57.4%, respectively, compared to the participation rates in 'career and vocational classes' (81.2%), 'career psychological tests' (84.4%), and 'career counseling' (63.2%), suggesting the need for efforts to expand career club and career experiences for high school students [31]. Furthermore, for career education programs that showed no significant effects in the DID estimation results, such as career psychological tests, career counseling, career lectures, career field trips and department experience, more rigorous analysis is needed to determine their effectiveness, and efforts to improve the contents and implementation methods of these career education programs are needed.

Secondly, in the case of 'career design and preparation,' one of the sub-factors of career development competency, no significant effects were observed across all career education programs with DID estimates. In other words, the effectiveness of career education programs in enhancing students' career design and preparation competency did not appear in the analysis results. Therefore, it can be deduced that there is a need for specialized and effective career education programs to nurture this career development competency. 'Career design and preparation' refers to the ability to make career decisions based on understanding and exploration of careers and jobs, and to creatively and diversely plan and prepare for one's own career [32]. Considering the significance and value of this competency in helping high school students make decisions about their post-graduation careers and prepare for them, more practical career education programs designed and implemented to cultivate this competency are needed.

Lastly, the DDD analysis was conducted to examine whether the effectiveness of career education programs in enhancing career development competencies differs based on high school students' post-graduation plan (college entrance or getting a job). The results showed that the effects of career club and job simulation varied depending on the students' post-graduation plans. This analysis suggests that both schools and governments need to provide tailored career education programs based on students' career plans to improve their career development competency. The implementation of individualized career education for students is anticipated to facilitate their exploration of a wide array of career paths. This, in turn, is poised to bolster students' self-directed learning, motivation, and ultimately culminate in an augmentation of their overall life satisfaction [33].

Based on the aforementioned findings, it can be extrapolated that in order to optimize the effectiveness of career education programs, there exists a requisite to augment student-centered experiential career programs while also incorporating career education activities that take into account individual students' career plans. Nevertheless, according to Park et al. [34], the quality of career education programs and students' satisfaction with them also significantly impact students' career development competencies. Therefore, it is essential not only to develop and provide diverse career education programs to students, but also to continually endeavor to evaluate and improve the qualitative aspects of career education programs to make career education more profound and effective.

Furthermore, considering the effectiveness of career experience among the nine career education programs, it is imperative to invigorate such career experience programs with the aim of enriching the career development competencies of high school students. However, given that career experiences predominantly occur outside the school environment, the groundwork for effective career education activities hinges upon the establishment and utilization of community-level infrastructure regarding career experience programs [35]. To address this, there is a need to establish a career experiential network that facilitates inter-school collaboration, interactions between schools and Local Education Agencies, and engagement with external institutions. Such a network would serve to uncover a spectrum of diverse career experiential opportunities and enable the creation of career education programs customized to the unique characteristics and needs of students. Moreover,

to provide essential support for these initiatives, it is incumbent upon Local Education Agencies and the Ministry of Education to allocate both educational and financial resources to the development of the requisite career experiential infrastructure [36].

6. Limitation and Future Research

This study has several limitations restricting the inferences of the aforementioned results. The assumption underlying the DID estimation is the common trends between the treatment and the control groups. In other words, it assumes that if a particular policy or program had not been implemented, both groups would have changed to the same extent. To verify this assumption, a process is required to demonstrate the similarity in trends between the two groups before and after the implementation of the policy or program. Autor [37] and Woo [28] proposed a method to examine the changes in trends before and after the treatment by introducing time-lagged variables. However, in this study, due to the utilization of survey data from the second and third grades of high school students in KEEP II, it is challenging to include time-lagged variables, which limits this study's ability to reflect a post-graduation survey on career development competency. Therefore, in the future, efforts using longer-term data are needed to ensure the validity of DID estimation, and alongside this, efforts to design and implement more practical career education programs for nurturing career development competency based on those empirical analyses are necessary.

Furthermore, for a more robust evaluation of the causal impact of career education programs, it is imperative to employ longitudinal and multilevel data in conjunction with advanced AI and machine learning methodologies in forthcoming investigations. In light of recent exploratory research that has successfully applied mixed-effects random forests to longitudinal and multilevel data [38,39], it has become evident that future studies should embrace more refined and stringent AI and machine learning techniques, particularly utilizing a panel or multilevel dataset.

Lastly, there has been a discernible shift in the landscape of career education research in recent years. The focus has evolved beyond traditional examination of its effectiveness, encompassing a broader range of inquiries. These inquiries now encompass endeavors such as reducing disparities in career education through an equity lens [40], developing diagnostic instruments for assessing career decision self-efficacy using item response theory (IRT) [41], exploring the intricacies of conceptualizing career chance, and investigating the sociocultural factors intertwined with career chance [42]. Additionally, there has been a surge in efforts to formulate strategies aimed at augmenting career education within higher education [43]. Consequently, it has become crucial not only to diversify the array of topics within the ambit of career education, but also to actively promote its integration within primary and secondary education and the realms of higher education and lifelong learning. Moreover, it is imperative that we pledge to undertake more substantive research endeavors in the sphere of career education in the future.

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Appendix A. Summary of the Existing Literature Regarding Career Education Programs

No	Authors (Publication Year)	Purpose	Data (Survey Year)	Main Findings
1	Gottfried et al. (2018) [22]	To examine the efficacy of career and technical education on high school students' outcome	ELS:2002 participants 11,000 students (2002: 10th grade, 2004: follow-up, 2006: 2nd year after high school graduation)	Career education programs were associated with a lower high school dropout rate and a higher likelihood of high school graduation.
2	Plank et al. (2008) [23]	To examine how combinations of career and technical education and core academic courses influence the likelihood of leaving school	NLSY97 survey of 1628 students (18–20 years old)	Integrating career education programs with the regular curriculum lowered the likelihood of leaving school
3	Bishop et al. (2004) [24]	To assess the effects of offering vocational education in high school on completion rates and subsequent earnings	12 years of longitudinal data	Students who devoted about one-sixth of their time in high school to occupation-specific vocational courses earned at least 12% extra one year after graduating and about 8% extra seven years later
4	Mane (1999) [25]	To explore the relationship between high school career education and wages	NLS-72 9440 students, HS&B-80 5998 students, NELS-88 4839 students	Tronng association between high school career education programs and wage increases in the labor market
5	Lim (2005) [9]	To explore the effect of school career education	KEEP I Survey of 6000 high school students I (2004)	There is a positive relationship between participation in school career education program and high school students' career development self-efficacy
6	Chu et al. (2017) [10]	To explore the effect of career experience on career maturity	Survey of 5716 middle school students (2017)	Career experience has positive effects on self-understanding, information exploration, attitudes toward occupations, career planning, and rational decision-making
7	Jang (2018) [6]	To investigate the effect of school career education activities on career development competencies	School Career Education Survey of 9386 middle school students (2017)	There are positive relationships between participation in career exploration in curriculum classes, career psychological tests, career experiences, and career clubs and career development competency
8	Kim (2019) [13]	To explore the influence of school-based career education activities on the career development competencies	KEEP II Survey of 216 multicultural high school students (2016)	Higher satisfaction with career-related curriculum classes and career psychological tests was associated with higher career development competencies
9	Seongok et al. (2020) [14]	To examine the structural relationship between career education within schools and career development competencies	School Career Education Survey of 9546 high school students (2018)	There are positive relationships between participation in school-based career education activities and career development competencies
10	Park et al. (2022) [16]	To identify factors influencing the career development competencies of vocational high school students	KEEP II Survey of 3633 vocational high school students (2016, 2019)	Participation in career practical experiences, departmental experiences, career-related activities within creative experiential activities, and satisfaction with career education have positive effects on career development competencies
11	Park (2017) [11]	To critically analyze the outcomes of high school career education	Literature review	The goals, actors, meanings, and emphasis of career education, as well as expected students' attitudes and the roles of schools and teachers in career education are described ambivalently and ambiguously in the literature
12	Lee (2017) [7]	To closely examine the realities of career guidance in general high schools	Qualitative research on 2 schools in Seoul	There are concerns about career counseling expertise and the conflicts between career education and college entrance guidance

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