The Effect of Youth Entrepreneurship Education Programs: Two Large-Scale Experimental Studies

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Abstract
Recent years have witnessed the worldwide growth of entrepreneurship education (EE) as entrepreneurship is regarded as the key driver of innovation and economic growth. Most extant studies on EE have focused on its impact on entrepreneurial intentions. However, the application of the same EE measurements for both adults and adolescents has long been criticized; the indices developed for potential adult entrepreneurs may not be suitable for young entrepreneurs, considering the large time gap before they enter the workforce. This study aims to develop appropriate indicators for the assessment of youth EE in Korea and to examine the effectiveness of youth EE. Two large-scale quasi-experimental studies were conducted with pre- and posttest matched-comparison groups for verification. This study suggests six common variables for measuring the impact of youth EE: opportunity discovery, opportunity exploitation, entrepreneurship, creativity capacity, social problem solving, and entrepreneurial intention. The analyses showed that all these indicators positively influenced youth EE. We also proposed practical suggestions for the development of EE programs.

Keywords
entrepreneurship education program, effectiveness of entrepreneurship education, measurement of youth entrepreneurial education programs

Introduction
Since its conception at the Harvard Business School in 1947, entrepreneurship education (EE) has spread rapidly throughout the world (Katz, 2003; Kuratko, 2005). Overcoming the early debate over whether or not entrepreneurship could be taught, recent researchers have become increasingly interested in how to teach entrepreneurship and how to evaluate EE (Block & Stumpf, 1992; Drucker, 1985; Gorman et al., 1997; Henry et al., 2005; Peterman & Kennedy, 2003; Ronstadt, 1985; Souitaris et al., 2007). Many empirical studies regarding EE have found that it is closely related to students’ entrepreneurial motivation and venture creation skills, which contribute to entrepreneurial firms’ performance (Nabi & Liñán, 2011; Rideout & Gray, 2013). Therefore, EE is believed to contribute to economic development and job creation (Bosma et al., 2008).

In recent years, many countries have expanded the scope of EE to include not only adults but also adolescents. In the United States, EE has been implemented in more than 40 states since the “Startup America Initiative” in 2011, and in 2016, EE standards were developed for three grade groups: Grade 5, Grades 6 to 8, and Grades 9 to 12. The Oslo Declaration of Education in Europe has greatly supported the development of EE. European governments have integrated EE with the existing educational programs and activities of secondary schools and constructed a platform to diffuse EE knowledge (European Commission, 2006). In the United States and Europe, EE is not necessarily meant only for starting a new business but for improving the competencies that are essential for entrepreneurs (Fayolle & Gailly, 2009; Hytti & O’Gorman, 2004; Organisation for Economic Co-Operation and Development, 2009). The Korean Ministry of Education has enacted a “free semester system” in middle school courses, which comprises a curriculum that focuses on various experimental activities and career education without midterm and final exams for one or two semesters. Youth EE, developed by various institutions, has been provided to secondary schools through this system in various forms such as a regular education, short-term camps, and school clubs.

Despite the advances in EE, the impact of EE has not been rigorously measured. As the development of entrepreneurial

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attitudes and skills is regarded as the purpose of EE, entrepreneurial intention has been the most widely used measure for the impact of EE (Bae et al., 2014). However, the critical question of the impact of EE remains unanswered (Block & Stumpf, 1992; Garavan & O’Cinneide, 1994; Honig, 2004). Few studies have sought to examine the impact of EE considering program design, pedagogical approach, and teaching method (Dilts & Fowler, 1999). Many scholars have criticized the application of the same EE measurements for different audiences, learning objectives, and curricula (Pittaway & Cope, 2007). As adolescents have an extended period before entering society than adults do, it may be inappropriate to use entrepreneurial intention as the only marker of EE effectiveness. Liñán (2004) categorized EE into four types: entrepreneurial awareness education, education for start-ups, education for entrepreneurial dynamism, and continuing education for entrepreneurs. Entrepreneurial awareness education is aimed at students who do not have any experience in starting a business. According to many youth EE programs, education focuses on understanding the environment, finding opportunities, solving problems, and doing something new rather than actually starting a business (Busenitz et al., 2014). EE institutions provide broad entrepreneurial awareness and activities, and these programs are not necessarily aimed at participants creating their own businesses in the short term. The most obvious and the simplest measure is frequently not the most appropriate. Limiting the evaluation of EE to its impact in terms of entrepreneurial intention can be misleading and short-sighted, as the impact of these programs on its audiences can be complex and, in some cases, is only visible after some delay (Fayolle et al., 2006). Thus, assessment criteria should be based on the educational level, EE program objectives, and target audience, all of which must be identified prior to evaluation (Bechard & Toulouse, 1998).

Most entrepreneurial awareness education focuses on the impact of EE programs in terms of the development of student mindsets and attitudes rather than the number of businesses launched. The contents of EE programs typically focus on understanding entrepreneurial thinking and developing an innovative and creative capacity to solve problems. This situation has given rise to the need for research regarding the impact of various EE programs on their participants (Athayde, 2009; Karimi et al., 2014; Volery et al., 2013; Zhang et al., 2014). The present study endeavors to improve measurement instruments adapted to the specific characteristics of the youth EE programs by following three steps. The first step involves reviewing a wide range of entrepreneurship definitions on the basis of which EE programs are designed. The second step involves identifying the general objectives of EE by reviewing EE literature. The third step involves analyzing the learning objectives of two representative youth EE programs and matching variables to the concept of entrepreneurship in literature. This approach suggests new perspectives for examining the effect of EE programs, considering the target audience, curriculum objectives, and entrepreneurship literature.

Furthermore, within this area of investigation, some studies have reported inconsistent and ambiguous findings (Lorz et al., 2011). Martin et al. (2013) noted that several studies did not meet a high standard of methodological rigor. Remarkably few studies have been designed to include both pre- and postevaluation measures and control groups. This study attempts to achieve an advanced quasi-experimental design involving pre- and posttests and comparison groups.

The aims of this study were twofold. The first was to determine appropriate indicators for youth EE programs. We analyzed two representative EE programs in Korea and developed adequate measures for youth EE programs. The second goal was to evaluate the effectiveness of EE programs with a more accurate and sophisticated methodology.

The remainder of this article is structured as follows. “Introduction” section provides crucial contextual information regarding the impact of EE and methodological issues. “Literature Review” section identifies the critical factors underlying EE programs and “Materials and Methods” section presents the research design and methodology. Subsequently, the data are analyzed quantitatively, and the results are reported in “Results” section. Finally, “Conclusion” section provides the concluding remarks.

### Literature Review

Many scholars have agreed that EE has made remarkable progress in the field of entrepreneurship (Kuratko, 2005; Pittaway & Cope, 2007; Solomon et al., 2002; Vesper & Gartner, 1997). There is a common belief that EE would help to influence entrepreneurial culture and build enterprising economies among many stakeholders, including policymakers, academics, and students. However, there are still issues regarding crucial definitions, especially those of the most vital terms like entrepreneurship itself (Cunningham & Lischeron, 1991; Gartner, 1990; Heber & Link, 1989). Over the years, numerous scholars have defined entrepreneurship based on various views (Drucker, 1985; Gartner, 1988); however, there is still no consensus on the meaning of entrepreneurship. This situation has led to the confusing application of the term “entrepreneurship education” (Garavan & O’Cinneide, 1994; Gartner, 1990; Pittaway & Cope, 2007).

Furthermore, various types of EE have emerged in different stages of development. Many educational institutions have developed the contents of EE programs based on educational levels, pedagogical methods, and philosophy. Entrepreneurship is generally defined as the capacity or willingness to create a business venture, taking on financial risks to make a profit. In a broader sense, from the perspective of entrepreneurial awareness education (Liñán, 2004), it involves making a change in the world by solving problems, creating an innovative product, or developing a new life-changing solution. To fully understand these issues of
definition, we reviewed entrepreneurship literature wherein entrepreneurship was defined as a source of entrepreneurial awareness education. Table 1 reveals the definitions of entrepreneurship in previous literature.

Mwasalwiba (2010) reviewed 20 articles to establish a definition of EE. Few authors have attempted to define EE; hence, there is an inherent lack of a common definition. Moreover, most articles have used terms like entrepreneurship education, enterprise education, or entrepreneurial education, interchangeably (Gorman et al., 1997; Hynes, 1996; Wai & Man, 2007). Definitions were structured such that they reflected the major goals and objectives to be achieved by target audiences (Table 2). The findings show that 32% of the reviewed EE-related articles were aimed at improving individuals’ attitudes, values, intentions, and behaviors toward entrepreneurship and, equally, the acquisition of personal skills, whereas other studies focused on new business formation (18%), opportunity recognition (9%), and the management of existing firms (9%).

Most scholars state that the objectives of EE generally involve increasing or creating entrepreneurial spirit, culture, and attitudes (Be’chard & Toulouse, 1998; Co & Mitchell, 2006; Gibb, 1993; Henry et al., 2005; Hills, 1988; Hytti & O’Gorman, 2004; Kirby, 2004).

Kirby (2004) reviewed approximately 205 EE programs to identify the various types of EE and found three main types: (a) programs that develop entrepreneurial orientation and awareness; (b) programs that develop competencies for new enterprise formation, self-employment, or economic self-sufficiency; and (c) programs that focus on small business survival and growth. Garavan and O’Cinneide (1994) classified entrepreneurial training into three categories: (a) entrepreneurial awareness education that usually occurs in secondary schools; (b) in-field education and training for small business ownership; and (c) more specialist education to enable people to update their skills. This study attempts to establish adequate measurements for entrepreneurial awareness education, which is generally conducted in secondary school. It is imperative to develop an entrepreneurial mindset at an early stage of one’s life, not only for start-ups and new ventures. Based on our review of these studies, we developed an indicator for the first type of EE program, which provides entrepreneurial orientation and awareness for youth. In terms of entrepreneurship’s influence on an individual’s ability to transform inspirations into actions, youth should learn to realize their entrepreneurial aspirations; this will lead to economic growth and new career opportunities.

Meanwhile, many studies have focused on examining the impact of EE. Most studies have accepted entrepreneurial intention, which refers to one’s desire to own one’s business (Crant, 1996) or to start a business (Krueger et al., 2000), as an indicator of EE outcomes. However, there has been

Table 1. Definitions of Entrepreneurship in the Literature.

| Authors (year) | Definitions |
|---------------|-------------|
| Schumpeter (1934) | New combinations refer to the introduction of a new product or a new quality of a product, a new method of production, a new market, a new source of supply of raw materials or half-manufactured goods, and finally implementing the new organization of any industry |
| Kirzner (1975) | Alertness to profit opportunities; arbitratorship |
| Stevenson et al. (1989) | The pursuit of opportunity without regard to resources currently controlled |
| Low and Macmillan (1988) | The creation of a new enterprise |
| Drucker (1985) | The practice or activity of creating, of innovating |
| Timmons (1985) | The ability to create and build something from practically “nothing,” which is fundamentally a human, creative act |
| Kao (1993, 1995) | The process of doing something new (creation) and/or something different (innovation) for the purpose of creating wealth for the individual and adding value to society |
| Shane and Venkataraman (2000) | How, by whom, and with what effects opportunities to create future goods and services are discovered, evaluated, and exploited |
| Hitt et al. (2001) | The identification and exploitation of previously unexploited opportunities |

Table 2. Key Terms and EE Objectives.

| Key terms in definitions | General EE objectives |
|--------------------------|-----------------------|
| Attitudes, values, intentions, & behaviors | 32% Start-up & job creation |
| Opportunity recognition | 9% Contribution to society |
| Personal skills | 32% Stimulate entrepreneurial skills |
| New business | 18% Increasing entrepreneurial spirit/culture/attitudes |
| Managing existing firms | 9% |

Note. EE = entrepreneurship education.
Source. Adapted from Mwasalwiba (2010).
criticism that this simple measure is not appropriate for the youth as most undergraduate-level programs are intended to improve entrepreneurial awareness, for example, by recognizing environmental changes, identifying opportunities, and thinking creatively, rather than facilitate starting a business. Recent studies have suggested that EE assessment criteria must be developed based on the objective of the EE program, that is, the target audience (Be´chard & Toulouse, 1998; Pittaway & Cope, 2007). To determine the broad objectives of EE outcomes, we reviewed Lee’s (2019) article, which classified definitions of entrepreneurship from the perspective of job analysis, that is, entrepreneurship is regarded as a kind of job. Lee (2019) categorized the definitions of entrepreneurship into work agents, work objectives, work behavior, and work performance, and three entrepreneurship experts reached a consensus regarding the results. Work agents are entrepreneurship performers, work objectives generally represent business items or units, and work behavior describes the way in which a job is performed. Entrepreneurial behaviors observed in the literature include the discovery of a/the new combination (Schumpeter, 1934), innovation (Schuler, 1986; Schumpeter, 1934), risk-taking (McClelland, 1961; Schuler, 1986), innovative action (Gartner, 1985; Low & MacMillan, 1988; Timmons, 1985), the act of doing something new (creation) and/or something different (innovation; Kao, 1993), the discovery of opportunities unrealized by others (Vesper, 1983), and the pursuit of opportunities (Kirzner, 1975; Stevenson et al., 1989; Timmons, 1985). Table 3 lists the definitions of entrepreneurship based on Lee’s classification.

These concepts of entrepreneurship based on job analysis demonstrate a well-known variable, entrepreneurship orientation (EO), which includes innovativeness, risk-taking, and proactiveness. They also provide more factors related to opportunities such as opportunity discovery and opportunity exploitation. In addition, these concepts suggest factors such as creative capacity and social value creation, which are associated with Schumpeter’s (1934) concept of “creative destruction.” Athayde (2009) also agreed that there was a lack of evaluation of youth EE and developed an instrument to measure pupils’ attitudes toward enterprises (the ATE test). This test was based on the entrepreneurial attitude orientation (EAO) scale based on the attitude theory and subsequent works by McCline et al. (2000), and considered five dimensions: achievement, personal control, creativity, leadership, and intuition.

Unsurprisingly, there has been a considerable amount of empirical research linking EE to entrepreneurial activity, in the act of both venture creation and antecedents that have been offered as links to entrepreneurial activity (The Small Business Economy, 2006). An review of previous research revealed six main areas of research: (a) EE and venture creation; (b) EE and entrepreneurial intentions; (c) EE and opportunity recognition; (d) EE, entrepreneurial self-efficacy, and entrepreneurial orientation; (e) EE and the need for achievement and locus of control; and (f) EE and other entrepreneurial knowledge. Based on the state of EE research, current studies need more indicators of a possible link between EE and subsequent entrepreneurial activity. This study attempts to establish adequate measurements that connect these entrepreneurship variables with the objectives of EE programs.

Second, this study aimed to examine the impact of youth EE programs. Many scholars, such as Weaver et al. (2006), have been concerned with the low quality of EE studies. Nabi et al. (2017) reviewed 159 papers regarding the relationship between EE and entrepreneurial performance published from 2004 to 2016 and observed three main patterns. First, most studies focused on short-term, subjective impact measures such as entrepreneurial attitudes and intentions. Second, recent studies suggest that the impact of EE programs on behavior and attitudes is controversial because their findings suggest both positive and negative effects (Dickson et al., 2008; Fayolle, 2013; Martin et al., 2013; Thompson et al., 2010). These contradictory findings suggest that the methodologies or statistical methods, such as control groups and cross-sectional surveys, are inadequate (Ba et al., 2014). There are other substantial reasons for the contradictory findings regarding the impact of EE that may include a lack of understanding of different pedagogical methods. More research must be conducted to connect student entrepreneurial performance with pedagogical methods and curricula (Pittaway & Cope, 2007). Third, prior research is limited to data from over 10 years ago and focused on surveys until 2011. Few studies focus on the impact of university-level EE (Nabi et al., 2017), and almost no research that focuses on the impact of youth EE.

| Authors | Concept of entrepreneurship |
|---------|---------------------------|
| Schumpeter (1934) | Discovery of a/the new combination |
| Schuler (1986) | Innovativeness |
| Timmons (1985) | Leadership |
| Kao (1993) | Innovativeness |
| McClelland (1961) | Risk-taking |
| Schuler (1986) | |
| Timmons (1985) | |
| Schumpeter (1934) | |
| Kao (1993) | Creativity capacity |
| Stevenson et al. (1989) | Opportunity discovery |
| Vesper (1983) | |
| Kirzner (1975) | |
| Shane and Venkataraman (2000) | Opportunity exploitation |
| Hitt et al. (2001) | |
| Lumpkin and Dess (1996) | Proactiveness |
| Morris et al. (1994) | Social value creation |
| Kao (1993) | |

Source. Adapted from Lee (2019).
Rideout and Gray (2013) conducted a methodological critique of empirical literature regarding the impact of EE. In addition, the Academy of Management Learning and Education (Honig, 2004) and the International Entrepreneurship Management Journal have called for more rigorous research that explores the conceptual, theoretical, and methodological links among the various forms of EE (Greene et al., 2004). Storey (2000) developed a typology that classifies evaluation studies based on whether they follow few or all of six robust steps: (1) capture the number and description of participants; (2) perform Step 1 and capture the participants’ opinions regarding the treatment; (3) perform Steps 1 and 2 and capture the participants’ views of the differences in treatment; (4) perform a comparison between participants and a typical nonparticipant group; (5) perform a comparison between participants and a matched control; and (6) perform Step 5 and take into account (control for) self-selection bias. A vast majority of EE evaluations follow Steps 1 to 3 and are characterized as “monitorings.” Monitorings typically manifest in the literature as “grateful testimonials” or descriptive case studies and provide no supporting basis for establishing cause–effect inferences. In contrast, Storey (2000) found that evaluations that follow Steps 4 to 6 were inferentially stronger and provide a scientific basis for drawing causal conclusions.

To identify methodological problems, we reviewed recent studies regarding the impacts of EE published from 2010 to 2019 (Table 3). We included studies that met the following criteria: (a) empirical studies rather than conceptual studies; (b) published journal articles rather than unpublished material; and (c) studies that focused on higher education in terms of EE and its empirical impact on entrepreneurial outcomes. Regarding these articles, we focused on two factors: (a) the existence of a control group and (b) whether the studies used a cross-sectional or longitudinal methodology. Table 4 shows that most articles had no control groups and applied a cross-sectional methodology.

To validate conclusions based on experimental results, participants assigned to the experimental and control groups must be representative of the same population (Everitt, 2002). The purpose of having a control group is to eliminate other factors that may influence the results of an experiment, especially experimental errors and experimenter bias. The inclusion of a control group is essential when the experimental conditions are complex and difficult to isolate. To have a rigorous experimental design, a control group should be established to exclude various exogenous variables, such as rapid growth, the effects of regular classes, and school locations.

The vast majority of past studies adopted a cross-sectional methodology (Storey, 2000), while more recent studies adopted a longitudinal methodology due to the criticism leveled against cross-sectional studies. Longitudinal methodology is a research design that includes repeated tests of the same variables over time (Shadish et al., 2002); it is often used in psychology and sociology to examine rapid day-to-day fluctuations in behaviors, thoughts, and emotions. Unlike cross-sectional studies, longitudinal studies track the same people, thus making it possible to observe changes more accurately. In this study, we also conducted pre- and posttests to exclude time-invariant, unobserved individual differences.

### Materials and Methods

This study’s methodology comprised two parts: (1) developing adequate variables for the impact of youth EE and (2) examining EE with rigorous methodology. In Part 1, we categorized the concept of entrepreneurship based on literature and then reviewed the curriculum of two representative EE programs. Investigating these results helped us to develop the final variables. In Part 2, we measured the variables with pre- and posttesting, including control groups.

### Development of Youth EE Indicators

Based on the above literature review, we identified the definition of entrepreneurship and six significant measures of EE outcomes, namely, venture creation, entrepreneurial intention, opportunity recognition, entrepreneurial self-efficacy and orientation, need for achievement and locus of control, and other entrepreneurial knowledge. To develop more accurate indicators by considering the EE programs’ objectives and target audiences, we selected two representative programs, “Entship School” and “Hero School,” which have been implemented in secondary schools in Korea. Both programs involve lectures, practice, and small projects, and classes were arranged in teams of four or five students. We analyzed the curriculum contents with two experts in the education field and two experts in the entrepreneurship field. The researchers and instructors cross-checked the identified learning objectives and mapped them to the results of previous studies to obtain the final variables. We revised the questionnaire to suit students’ education level using a pilot test and verified the validity and reliability of the questionnaire.

**Entship school.** The Entship School program is conducted by an educational institution, “N,” and supported by a domestic IT (information technology) company, “O.” It is a career development program that improves students’ creative and problem-solving capacity by enhancing their understanding of the industrial environment. The program comprises six classes of 2 hr each. It sought to reinforce students’ entrepreneurial mindset, which includes innovativeness, risk-taking, and proactiveness, by practicing the problem-solving card, which describes how companies address difficulties. It also sought to improve career preparation behaviors by exploring future jobs and understanding the fourth industrial revolution using different video materials. “Mini Company” and “10-dollar workshop” are activities that offer lessons to
| Authors (year)                      | Sample size | Subjective | Control group (O, X) | Cross-sectional vs. longitudinal | Methodology                          | IV                                      | DV                                      |
|------------------------------------|-------------|------------|----------------------|----------------------------------|--------------------------------------|-----------------------------------------|-----------------------------------------|
| Bakotić and Kružić (2010)         | 176         | X          | Cross-sectional      | Descriptive regression           | Entrepreneurship perception          | Entrepreneurial intention              |                                         |
| Aslam et al. (2012)                | 197         | X          | Cross-sectional      | t test Regression analysis       | Personal attitudes                   | Social norms                            | Perceived behavioral control            | Entrepreneurial Intention              |
| Athayde (2009)                     | 196         | O          | Cross-sectional      | Multiple analysis of variance    | EE                                   | Creativity                              | Personal control                        | Entrepreneurial Intention              |
| Azhar et al. (2011)                | 320         | X          | Cross-sectional      | Correlation analysis             | Previous EE                          | Parent self-employed                   | Entrepreneurial experience              | Entrepreneurial Intention              |
| Basu (2010)                        | 231         | X          | Cross-sectional      | t test Regression analysis       | EE                                   | Attitudes toward entrepreneurship       | Perceived behavioral control            | Entrepreneurial Intention              |
| Byabashaija and Katona (2011)      | 167         | X          | Longitudinal         | Paired-sample t test             | EE                                   | Subjective norms                       | Entrepreneurial intention              |                                         |
| Y. Chen (2010)                     | 327         | X          | Cross-sectional      | SEM                              | EE                                   | Self-efficacy                           | Entrepreneurial Intention              |                                         |
| Fayolle and Gailly (2015)          | 158         | x          | Longitudinal         | t test Regression analysis       | EE programs                          | EE                                      | Entrepreneurial intention              |                                         |
| Fretshner and Weber (2013)         | 49          | X          | Longitudinal         | PLS-SEM                          | EE                                   | Antecedents                             | Entrepreneurial intention              |                                         |
| Fumero et al. (2015)               | 145         | O          | Longitudinal         | Paired-sample t test             | EE                                   | Perceived behavioral control            | Subjective norms                       | Creativity                              | Entrepreneurial Intention              |
| Crane (2014)                       | 75          | X          | Cross-sectional      | LOT-R test ANOVA                 | Dispositional optimism               | Disposable                              | Entreprenurial Intention               |                                         |

(continued)
Table 4. (continued)

| Authors (year) | Sample size | Subjective | Control group (O, X) | Cross-sectional vs. longitudinal | Methodology | IV | DV |
|----------------|-------------|------------|----------------------|-------------------------------|-------------|----|----|
| Laviolette et al. (2012) | 276 | Management & entrepreneurship students | X | Longitudinal | SEM | Competencies Self-efficacy Attitudes Intention Antecedents | Entrepreneurial intention |
| Nowiński et al. (2019) | University students | X | Cross-sectional | PLS-MGA | EE | Entrepreneurial intention |
| Izquierdo and Buelens (2011) | 236 | Students in an entrepreneurship course | X | Partially longitudinal | SEM | Perceived competency Attitudes Self-efficacy Antecedents | Entrepreneurial intention |
| Oosterbeek et al. (2010) | College students | O | Longitudinal | Regression analysis ANCOVA | Entrepreneurial competencies | Entrepreneurial intention |
| Von Graevenitz et al. (2010) | 265 | Longitudinal | Regression analysis | | Attitude Confidence | Entrepreneurial intention |
| García-Rodríguez et al. (2019) | 547 | Primary school students | O | Cross-sectional | t test | | EE |
| Muñoz et al. (2019) | 13 | Doctoral students in science and technology | X | — | Multiple case studies | EE | Opportunity identification Communication skills Entrepreneurial intention | |
| Hahn et al. (2019) | 427 | University students | X | Cross-sectional | Moderated regression analysis | EE | Entrepreneurial skills |

Note. IV = independent variable; DV = dependent variable; EE = entrepreneurship education; SEM = structural equation modeling; PLS-SEM = partial least squares structural equation modeling; LOT-R = Life Orientation Test–Revised; ANOVA = analysis of variance; PLS-MGA = partial least squares multi-group analysis; ANCOVA = analysis of covariance.
students on exploring business opportunities in their own lives and working on a project with a team. This program aimed to help students start their careers and cultivate entrepreneurial intention. Table 5 presents the objectives of each curriculum, and the final variables matched with existing indicators obtained from previous research.

**Table 5. Curriculum of the Entship School.**

| No. | Topic | Activity            | Objectives                                      | Variables               |
|-----|-------|---------------------|-------------------------------------------------|-------------------------|
| 1   | Change the world and entrepreneurship | Marshmallow challenge | Understanding the environment                    | Opportunity discovery   |
|     |       |                     | Recognizing opportunities                      | Opportunity exploitation|
| 2   | Finding a problem in life “Reviewing the company” | Problem-solving card | Learning how to have an entrepreneurial mindset    | Career preparation behavior |
| 3   | Problem-solving detective team “Why are they entrepreneurs?” | Mini company workshop | Solving social problems                            | Entrepreneurial orientation |
| 4   | Cause analysis & creative ideation | 10-dollar entrepreneurship | Learning how to have an entrepreneurial mindset    | Entrepreneurial intention |
| 5   | Finding a solution | 10-dollar entrepreneurship | Improving creativity                              | Creativity capacity     |
| 6   | Entrepreneurship and me | Completing entrepreneurship | Preparing for their future career                 | Social problem solving  |

**Table 6. Curriculum of the Hero School.**

| No. | Topic                     | Activity        | Objectives                                           | Variables               |
|-----|---------------------------|-----------------|------------------------------------------------------|-------------------------|
| 1   | Fellowship formation & teamwork | Interest board game | Teamwork                                              | Self-concept            |
|     |                            |                 | Communication skills                                  | Career determination    |
|     |                            |                 | Establishing self-identification                      | Self-efficacy           |
| 2   | Exploration of talent and potential through the past | Drawing my life timeline | Planning a future career                             | Opportunity discovery   |
|     |                            |                 |                                                     | Opportunity exploitation|
| 3   | Exploration of talent and potential through the ambition | Building the mountain of dreams | Learning entrepreneurial mindset                      | Entrepreneurial orientation |
|     |                            |                 |                                                     | Entrepreneurial Intention|
| 4   | Take action on a small problem | Mini-project | Learning entrepreneurial mindset                      | Creativity capacity     |
| 5   | Discovery problems or opportunities | Problem-solving card | Recognizing opportunities                            | Social problem solving  |
| 6   | Finding solutions | Youth project introduction | Solving social problems                              |                         |
| 7   | Designing project step-by-step | 30-dollar project | Improving creativity                                 |                         |
| 8   | Collaborate to troubleshoot | 30-dollar project | Learning entrepreneurial process                      |                         |
| 9   | Improve sustainability | 30-dollar project | Motivating desirability to be an entrepreneur         |                         |
| 10  | Finale                    | Presentation    |                                                     |                         |

**Hero school.** The Hero School program is conducted by the educational institution “A” and supported by the domestic foundation “B.” The program comprises 10 classes of 2 hr each, including a self-exploration class and a mini-project, which encourages students to generate ideas and create value. Students establish a self-concept by asking themselves who they are and what they like through an “interest board game,” “a life timeline,” and “making a dream mountain.” It also includes a 30-min mini-project to help students learn how to take action in their daily lives. Next, the students participate in a 30-dollar project, wherein each team presents their ideas for the seed money of US$30. Finally, all teams present the project results, share their process, and evaluate the project’s value. Table 6 presents the objectives of each curriculum, and the final variables matched with existing indicators obtained from previous research.

**Common variables.** The final variables were identified based on the prior study review and program analysis. Consequently, we proposed six common variables: opportunity discovery, opportunity exploitation, entrepreneurial orientation, creativity capacity, social problem solving, and entrepreneurial intention. While the primary objectives of EE can be divided into five major categories as shown in Table 2, the objectives of youth EE programs primarily fall into three categories: (a) attitude, value, intentions, and behaviors; (b) opportunity recognition; and (c) personal skills. The first
category includes an entrepreneurial mindset, which refers to an entrepreneurial orientation, and the desire to be an entrepreneur, called as entrepreneurial intention. The second category includes opportunity discovery and opportunity exploitation. The third category includes entrepreneurial skill sets, which includes creativity capacity and social problem solving. Operational definitions of these variable are given as follows (Table 7):

| Variables                | Operational definition                                                                 | Subfactors                                      | No. of items | Reliability |
|--------------------------|----------------------------------------------------------------------------------------|-------------------------------------------------|--------------|-------------|
| Opportunity discovery    | A capacity to combine resources creatively and a possibility to meet the needs of the market | • Innovativeness                                 | 7            | .77         |
| Opportunity exploitation | Decision making for running new business ideas and an entrepreneurial action and passion to achieve a goal | • Risk-taking • Proactiveness                   | 6            | .76         |
| Entrepreneurial orientation | A willingness to lead one’s own life and create new opportunities through challenges | • Collaborative communication • Creative problem solving • Innovative work behavior | 13           | .79         |
| Creativity capacity      | A capacity to create new and useful outputs                                            | • Problem definition and formation • Decision making | 11           | .90         |
| Social problem solving   | A capacity to be able to define the real problem and to decide a reasonable solution by considering a number of cases |                                                | 7            | .89         |
| Entrepreneurial intention| An individual’s willingness to start his or her own company                            |                                                | 6            | .79         |

Opportunity discovery is defined as the ability to combine existing resources creatively to create better value to meet the needs of the market (Kirzner, 1975; Schumpeter, 1934). It is important to discover opportunities that could be of novel value before starting a business. Although this concept seems reasonable, an opportunity is more valuable when it is recognized as feasible (Kim et al., 2016).

Opportunity exploitation refers to actions wherein an individual views an idea differently and realizes it with the support of others (Scott & Bruce, 1994). According to Davidsson (2015), opportunity exploitation is defined as making a decision and implementing an action based on a venture mindset. Individuals can acquire or coordinate resources as well as create a new market through this process. In other words, opportunity exploitation refers to entrepreneurial endeavors and the enthusiasm in making decisions and achieving goals for implementing new business ideas.

Entrepreneurial orientation is not only a way of thinking but also a way of taking action. Many scholars have defined entrepreneurial orientation in their way; the widely adopted concept is the three dimensions of innovativeness, risk-taking, and proactiveness, as identified by Miller (1983). Innovativeness refers to the tendency to introduce and support creative ideas, experimental mindsets, and newness for generating new services, as well as aggressive activity that combines material and forces in a different way than daily life (Oh & Park, 2013). Risk-taking is the tendency to make a risk preference decision in an uncertain business environment, which is a motivation to actively seek and pursue opportunities (Covin & Slevin, 1990). Proactiveness is an “opportunity-seeking, forward-looking perspective involving introducing new products or services ahead of the competition and acting in anticipation of future demand to create change and shape the environment” (Lumpkin & Dess, 2001, p. 431). Students can understand the importance of entrepreneurship in creating value by learning about innovative firms and entrepreneurs. This process can influence not only their choice of future careers but also their attitudes in life.

Creativity capacity is a complex psychological process that involves productive and creative thought and an attitude that requires patience, fulfillment, change, and improvement (Taylor, 1988). Creativity has been defined in various ways; the most adopted one is the human ability to produce new and useful output (Hennessey & Amabile, 1988). The creativity capacity consisted three dimensions, which are creative problem solving, collaborative communication, and innovative work behavior. Creativity problem solving is the ability to solve problems in a creative way about the problem and environment at hand. Collaborative communication refers to the ability to effectively cooperate and exchange various information and opinions, such as ideas, reviews, and alternatives. Finally, innovative work behavior means the ability to innovate and apply various ideas to the work to produce efficient results (Kahleem et al., 2011).

Social problem solving refers to the cognitive, emotional, and behavioral processes that individuals use to manage all kinds of situations, such as personal, group, and social situations, effectively and flexibly (D’Zurilla, 1986; D’Zurilla & Nezu, 1982). It refers to the effort to define problems by understanding the different interests of others and solving them rationally, which is very similar to the learning objectives of youth EE.
Entrepreneurial intention refers to an individual’s will to establish new organizations via entrepreneurship (Oh & Park, 2013). This factor is the most important predictor of behaviors; various studies have widely adopted and examined this strategy to determine how entrepreneurship has influenced entrepreneurial intention (Cho & Kim, 2015; Park & Yang, 2014; Yoon, 2012). In addition, many studies have suggested that more education could increase the youth’s entrepreneurial intentions (Y. S. Choi et al., 2016).

Hypothesis development. The aim of this study is to evaluate the effectiveness of the youth EE program. We have established six common variables behind youth EE programs and those are consistent with the general EE objectives of prior studies. Scholars have argued that entrepreneurship is not a trait with which someone is born but rather one learned through experience, which is a crucial premise of experiential learning-based entrepreneurial education. Therefore, based on this argument, six hypotheses were tested on two different groups. Opportunity is the process by which individuals pursue their desires regardless of the current resources and can be perceived differently depending on the specific time, situation, and individual (Stevenson, 1983). Prior knowledge influences one’s opportunity competence. Opportunity discovery and opportunity exploitation are theoretically structured concepts; however, it is not easy for young people to acquire information through entrepreneurial experience. Youth EE programs include project activities to create and implement ideas, which could enhance the participants’ ability to discover opportunities in their daily lives. Youth, in

### Table 8. Descriptive Statistics of the Subjects at Institution N.

| Frequency of high school student (%) | Frequency of middle school student (%) |
|--------------------------------------|----------------------------------------|
|                                      | Experimental | Control | Gender                                      | Experimental | Control |
|                                      | Male         | Female  | Gender                                      | Male         | Female  |
|                                      | Male         | Female  | Male                                        | Male         | Female  |
|                                      | 92 (22)      | 127 (43.5) | 147 (54) | 135 (49.5)  |
| Gender                                | 189 (67)     | 166 (56.5) | 124 (46) | 138 (50.5)  |
| Age                                   | 16           | 6 (2)   | 23 (8) |
|                                      | 17           | 86 (30) | 161 (60) |
|                                      | 18           | 182 (65) | 161 (60) | 148 (54)  |
|                                      | 19           | 6 (2)   | 85 (31) |
|                                      | 20           | 1 (1)   | 25 (9) |
| Grade                                 | 1            | 92 (32.5) | 162 (60) | 144 (53)  |
|                                      | 2            | 86 (30) | 136 (46) | 81 (30)  |
|                                      | 3            | 182 (65) | 136 (46) | 81 (30)  |
|                                      | 4            | 6 (2)   | 85 (31) |
|                                      | 5            | 1 (1)   | 25 (9) |
| Total                                 | 281          | 293     | 271 |

### Table 9. Demographics of the Samples in Institution A.

| Frequency of high school student (%) | Frequency of middle school student (%) |
|--------------------------------------|----------------------------------------|
|                                      | Experimental | Control | Gender                                      | Experimental | Control |
|                                      | Male         | Female  | Gender                                      | Male         | Female  |
|                                      | 101 (45.7)   | 112 (500.7) | 127 (67.9) | 116 (62.0)  |
| Gender                                | 120 (54.3)   | 109 (49.3) | 60 (32.1) | 71 (38.0)  |
| Age                                   | 16           | 1 (54.3)  | 2 (1.1) |
|                                      | 17           | 4 (1.8)   | 13 (6.9) |
|                                      | 18           | 170 (76.9) | 200 (90.5) | 113 (60.4) | 115 (61.5)  |
|                                      | 19           | 45 (20.4) | 15 (6.8) | 50 (26.7) |
|                                      | 20           | 1 (0.4)   | 0 (0.0) | 2 (1.0) |
| Grade                                 | 1            | 178 (80.5) | 0 (0.0) | 112 (59.9) | 121 (64.7)  |
|                                      | 2            | 43 (19.5) | 207 (93.7) | 15 (8.0)  |
|                                      | 3            | 0 (0.0)   | 13 (5.9) | 60 (32.1) |
| Total                                 | 221          | 221     | 187 |

Entrepreneurial intention refers to an individual’s will to establish new organizations via entrepreneurship (Oh & Park, 2013). This factor is the most important predictor of behaviors; various studies have widely adopted and examined this strategy to determine how entrepreneurship has influenced entrepreneurial intention (Cho & Kim, 2015; Park & Yang, 2014; Yoon, 2012). In addition, many studies have suggested that more education could increase the youth’s entrepreneurial intentions (Y. S. Choi et al., 2016).
particular, are more influenced by their social environment, such as parental support and education, because they have less prior experience.

**Hypothesis 1:** EE increases opportunity discovery in the experimental group.

**Hypothesis 2:** EE increases opportunity exploitation in the experimental group.

Entrepreneurial orientation is a process that starts with an opportunity, which originates in prior knowledge and experiences. Many entrepreneurs recognize and perceive opportunities in a dynamic environment, and their belief in an abundant availability of resources influences their EO by inspiring self-belief that they will be able to acquire what is needed to pursue the opportunity (Chandler & Hanks, 1994). EE strives to develop an entrepreneurial mindset and knowledge of fundamentals such as entrepreneurs’ role in society, challenges and tasks, and key competences in the start-up phase (Liñán, 2008).

**Hypothesis 3:** EE increases entrepreneurial orientation in the experimental group.

Creativity capacity is considered the central concept of entrepreneurship and particularly relevant in entrepreneurial education (Timmons & Spinelli, 2004). Schumpeter uses the term *creative destruction*, which occurs when a company destroys the existing market through innovation. Creativity in individual perspectives is the precursor of innovative behavior, and therefore, it is a key factor of “enterprising potential.” Recent studies have also emphasized the crucial role of creativity in the entrepreneurial process that leads to economic activity (Curran & Burrows, 1986; Morrison, 1998). Adolescence is the period that students develop their creativity qualitatively through physical, cognitive, emotional, and social changes (J. B. Choi & Kim, 2000). The youth EE program is in line with the creative career development, providing a flexible environment that enables creativity to be expressed and supports systematic training. In Korea, since the beginning of the seventh education curriculum in 2000, “cultivating creative humans” has been the fundamental goal of youth education (Chang et al., 2015). It is a period for youth to implement creativity through EE because adolescents have the potential to significantly improve their learning skills and attitudes (I. J. Choi et al., 2008).

**Hypothesis 4:** EE increases creativity capacity in the experimental group.

Social problem solving focuses on confronting real-life problems through a social learning process of social skills rather than in a social environment (D’Zurilla & Nezu, 1990). The majority of EE programs are closely associated with contribution to society by solving practical problems in customer service or in the local community (Mwasalwiba, 2010). Students can learn to identify the surrounding situation and the positions of various stakeholders to define the problem, calculate alternatives, and make decisions by presenting reasonable solutions to overcome the current problem facing them.

**Hypothesis 5:** EE increases social problem solving in the experimental group.

Entrepreneurial intention is defined as the desire to own a business (Crant, 1996). Although a majority of studies have confirmed the positive linkage between EE and entrepreneurial intention (Bae et al., 2014; Martin et al., 2013; Rauch & Hulsink, 2015; Souitaris et al., 2007), this relationship has also had adverse consequences (Oosterbeek et al., 2010). There is limited research with rigorous methodology (Martin et al., 2013). Few studies have investigated the impact of EE adapting a longitudinal method and control groups. To examine with an advanced quasi-experimental design, we use the control group to compare the exact impact on the experimental group.

**Hypothesis 6:** EE increases entrepreneurial intention in the experimental group.

**Measurement of the Youth EE Effect**

**The sample.** The participants in this study were middle and high school students in Korea. The sample collection process took place as follows. Two institutions (“N” and “A”) offered EE programs on their institutional homepages. Each institution selected schools that were willing to cooperate with the EE program and were located in different provinces such as...
Seoul, Gyeonggi, Gwangju, Busan, and Jeju. We described the purpose and process of this study to teachers and requested their cooperation in creating the experimental and control groups. The experimental group in this study comprised students who wanted to participate in the EE program or received a recommendation from their teachers; the control group comprised students who had not participated in the EE program. The two EE programs were conducted independently, and the number of experimental and control groups was nearly identical.

Although this study attempts to meet methodological rigor standards, there still remains the issue of nonprobability convenience sampling. Research has reported a selection bias, wherein EE volunteers differ significantly from nonvolunteers in the pretest for entrepreneurial intention (Chen et al., 1998; Zhao et al., 2005). This self-selection can pose a threat to internal validity. However, concerns about selection bias affecting internal validity can be reduced by utilizing a pretest to control for the previous effects statistically. This study intends to achieve a more vigorous pre- and posttest matched-comparison group quasi-experimental design. The hypotheses were evaluated using a powerful statistical method, analysis of covariance (ANCOVA), which statistically controls for the effects of other continuous variables, known as covariates. Covariates are variables that should be controlled because they are not independent variables in the experimental design but can affect the dependent variables. As the students’ pretest scores can affect their posttest scores, the average scores for the dependent variables were analyzed by setting the pretest scores as covariates.

Finally, we collected and analyzed 1,118 valid samples in the program at Institution “N.” The demographic distribution indicates that the sample comprised 574 high school students, divided into 281 experimental groups and 293 control groups, and 544 middle school students, divided into 271 experimental groups and 273 control groups. We collected and analyzed 816 valid samples in the program of “A” institution. The demographic distribution shows that the sample comprised 442 high school students, divided into 221 experimental groups and 221 control groups, and 374 middle school students, divided into 187 experimental groups and 187 control groups.

**Research design.** As Nabi et al. (2017) recommended, we set the number of control groups equal to the number of experimental groups within the same school to overcome methodological issues. We designed pre- and posttests to verify the degree of changes that occurred due to treatments or interventions. The experimental group was given the EE program treatment and the results were gathered upon program completion. The control groups received no treatment over the same period but underwent the same tests. This process improved the internal validity of this research and clarified the causal relationships. Surveys were conducted before and after the treatment to control for the effect of the subjects’ prior abilities.

**Research tools.** The content validity of these research tools was verified by two experts in the education field and two experts in the entrepreneurship field; we conducted a pilot test to supplement the terms, meaning, and level. The Likert-type scales use a fixed-choice response format and were designed to measure the dependent variables. To measure opportunity discovery and opportunity exploitation, we included seven items and six items for opportunity discovery and opportunity exploitation, respectively, using the measurement tools suggested in Lim’s (2015) study. To measure entrepreneurial orientation and entrepreneurial intention, we included 13 items for EO that comprise three subfactors, namely, innovativeness, risk-taking, and proactiveness, and six items for entrepreneurial intention, using measurement tools employed by An (2016). We included 11 items to measure creativity capacity, including three subfactors: collaborative communication, creative problem solving, and innovative behavior, using measurement tools employed by Ahn (2017). To measure social problem solving, we included seven items that comprise two subfactors, namely, problem definition and formation, using measurement tools employed in D’Zurilla and Nezu’s (1990) work.

This study aimed to examine the effect of youth EE programs in Korea and suggest future directions for faculty and schools. We utilized ANCOVA to compare the experimental groups that received the youth EE treatment with the control groups. The ANCOVA is a method for controlling nuisance variation statistically. The pre- and posttests were designed using the same metric; the pretest was used as the covariate, whereas the posttest was used as the dependent variable. We employed SPSS 24.0 for statistical analysis.

**Results**

**“N” Institution**

Table 11 presents the differences between the pretest and posttest scores of the experimental and control groups of high school students. When we examined the pretest scores of the groups, it was noticeable that the experimental groups had higher corrected posttest scores for all variables compared with the control groups.

As seen in Table 12, there were statistically significant differences in the corrected posttest scores after adjusting the covariate for all variables. The ANCOVA results show that all variables showed significant differences: opportunity discovery ($F = 89.34, p < .001$), opportunity exploitation ($F = 55.02, p < .001$), entrepreneurship ($F = 44.58, p < .001$), creativity capacity ($F = 54.47, p < .001$), social problem solving ($F = 30.07, p < .001$), and entrepreneurial intention ($F = 23.64, p < .001$).

Table 13 shows the average and standard deviation values of the final scores corrected based on the pretest scores of the middle school students. The corrected posttest averages and standard deviations for opportunity discovery, opportunity
exploitation, entrepreneurship, and entrepreneurship intention were 22.14 (6.24), 19.89 (5.49), 45.20 (10.29), and 17.50 (5.97), respectively, in the experimental groups, and 23.06 (6.19), 19.81 (5.40), 44.25 (10.51), and 17.54 (6.09), respectively, in the control groups. The corrected posttest scores for opportunity exploitation and entrepreneurship in the experimental groups were slightly higher than those in the control groups; however, the scores of opportunity discovery and entrepreneurial intention were almost equal to or even lower than those in the control groups.

Regarding the middle school students, ANCOVA revealed no significant differences in the corrected posttest scores for all variables: opportunity discovery ($F = 0.137, p > .05$), opportunity exploitation ($F = 1.511, p > .05$), entrepreneurship ($F = 1.093, p > .05$), and entrepreneurial intention ($F = 0.02, p > .05$; Table 14).

### Table 11. Results of Differences Between the Pretest and Posttest Scores (High School Students).

| Variables                  | Group         | N   | Pretest M (SD) | Posttest M (SD) | Corrected posttest M (SD) |
|----------------------------|---------------|-----|----------------|------------------|--------------------------|
| Opportunity discovery      | Experimental  | 280 | 21.82 (4.54)   | 25.43 (5.09)     | 25.43 (5.09)             |
|                            | Control       | 291 | 20.55 (5.50)   | 21.16 (5.17)     | 21.17 (5.17)             |
| Opportunity exploitation   | Experimental  | 281 | 21.88 (4.10)   | 23.38 (4.45)     | 23.38 (4.45)             |
|                            | Control       | 292 | 19.88 (4.76)   | 20.01 (4.73)     | 20.01 (4.73)             |
| Entrepreneurial Orientation| Experimental  | 278 | 47.61 (8.78)   | 49.74 (8.09)     | 49.74 (8.09)             |
|                            | Control       | 288 | 45.05 (8.28)   | 44.45 (8.71)     | 44.51 (8.68)             |
| Creativity capacity        | Experimental  | 278 | 40.28 (6.28)   | 42.69 (6.28)     | 42.69 (6.29)             |
|                            | Control       | 290 | 36.97 (7.70)   | 37.67 (7.34)     | 37.67 (7.34)             |
| Social problem solving     | Experimental  | 281 | 27.02 (3.98)   | 27.86 (4.25)     | 27.86 (4.25)             |
|                            | Control       | 293 | 25.18 (4.69)   | 25.39 (4.59)     | 25.39 (4.59)             |
| Entrepreneurial intention  | Experimental  | 281 | 18.36 (5.49)   | 19.73 (5.78)     | 19.73 (5.78)             |
|                            | Control       | 293 | 17.45 (5.81)   | 17.16 (5.95)     | 17.16 (5.95)             |

### Table 12. ANCOVA Results for the Posttest Scores (Using the Pretest as the Covariate).

| Variables                  | Source of variance   | Sum of squares | df | Average of squares | $F$  | $p$  |
|----------------------------|----------------------|----------------|----|--------------------|------|-----|
| Opportunity discovery      | Covariance (pretest) | 418.84         | 1  | 418.84             | 16.31| .000|
|                            | Treatment            | 2,294.07       | 1  | 2,294.07           | 89.34***| .000|
|                            | Error                | 14,585.15      | 568| 25.678             |      |     |
|                            | Total                | 17,589.64      | 570|                    |      |     |
| Opportunity exploitation   | Covariance (pretest) | 815.48         | 1  | 815.48             | 41.35| .000|
|                            | Treatment            | 1,085.17       | 1  | 1,085.17           | 55.02***| .000|
|                            | Error                | 11,242.52      | 570| 19.72              |      |     |
|                            | Total                | 13,674.64      | 572|                    |      |     |
| Entrepreneurial Orientation| Covariance (pretest) | 1,674.88       | 1  | 1,674.88           | 24.77| .000|
|                            | Treatment            | 3,013.75       | 1  | 3,013.75           | 44.58***| .000|
|                            | Error                | 38,061.97      | 563|                    |      |     |
|                            | Total                | 43,617.42      | 565|                    |      |     |
| Creativity capacity        | Covariance (pretest) | 1,534.58       | 1  | 1,534.88           | 34.69| .000|
|                            | Treatment            | 2,409.44       | 1  | 2,409.44           | 54.47***| .000|
|                            | Error                | 24,993.42      | 565| 44.24              |      |     |
|                            | Total                | 30,102.12      | 567|                    |      |     |
| Social problem solving     | Covariance (pretest) | 667.78         | 1  | 667.78             | 36.16| .000|
|                            | Treatment            | 555.27         | 1  | 555.27             | 30.07***| .000|
|                            | Error                | 10,544.39      | 571| 18.47              |      |     |
|                            | Total                | 12,083.84      | 573|                    |      |     |
| Entrepreneurial intention  | Covariance (pretest) | 1,620.83       | 1  | 1,620.83           | 51.16| .000|
|                            | Treatment            | 748.91         | 1  | 748.91             | 23.64***| .000|
|                            | Error                | 18,090.07      | 571| 31.68              |      |     |
|                            | Total                | 20,657.65      | 573|                    |      |     |

Note. ANCOVA = analysis of covariance.

***$p < .001$. 

...
Table 13. Result of Differences Between Pretest and Posttest Scores (Middle School Students).

| Variables               | Group         | N   | Pretest M (SD) | Posttest M (SD) | Corrected posttest M (SD) |
|-------------------------|---------------|-----|----------------|-----------------|--------------------------|
| Opportunity discovery   | Experimental  | 230 | 21.58 (5.29)  | 22.19 (6.26)    | 22.14 (6.24)             |
|                         | Control       | 230 | 22.19 (6.26)  | 22.98 (6.26)    | 23.06 (6.19)             |
| Opportunity exploitation| Experimental  | 232 | 19.78 (5.25)  | 19.93 (5.51)    | 19.89 (5.49)             |
|                         | Control       | 231 | 19.93 (5.51)  | 19.81 (5.42)    | 19.81 (5.40)             |
| Entrepreneurial orientation | Experimental | 269 | 45.54 (9.80)  | 44.96 (10.38)   | 45.20 (10.29)            |
|                         | Control       | 273 | 44.96 (10.38) | 44.10 (10.56)   | 44.25 (10.51)            |
| Entrepreneurial intention | Experimental | 271 | 17.34 (5.97)  | 17.50 (5.97)    | 17.50 (5.97)             |
|                         | Control       | 273 | 17.53 (5.80)  | 17.54 (5.69)    | 17.54 (5.69)             |

Table 14. ANCOVA Results for the Posttest Scores (Using the Pretest as the Covariate).

| Variables               | Source of variance | Sum of squares | df | Average of squares | F   | p   |
|-------------------------|--------------------|----------------|----|--------------------|-----|-----|
| Opportunity discovery   | Covariance (pretest) | 2,342.26       | 28 | 83.65              | 1.262 | .274 |
|                         | Treatment          | 6.658          | 1  | 6.658              | 0.137 | .712 |
|                         | Error              | 3,548.17       | 73.21 | 48.47          |     |     |
|                         | Total              | 16,848.19      | 487 |                   |     |     |
| Opportunity exploitation | Covariance (pretest) | 1,443.49       | 24 | 60.15              | 0.925 | .575 |
|                         | Treatment          | 74.24          | 1  | 74.24              | 1.511 | .226 |
|                         | Error              | 1,884.37       | 38.35 | 49.14          |     |     |
|                         | Total              | 12,875.83      | 495 |                   |     |     |
| Entrepreneurial orientation | Covariance (pretest) | 6,227.32       | 1  | 6,227.32          | 64.34 | .000 |
|                         | Treatment          | 105.79         | 1  | 105.79             | 1.093 | .296 |
|                         | Error              | 52,170.00      | 539 | 96.79            |     |     |
|                         | Total              | 58,520.04      | 541 |                   |     |     |
| Entrepreneurial intention | Covariance (pretest) | 2,811.04       | 1  | 2,811.04          | 90.02 | .000 |
|                         | Treatment          | 0.69           | 1  | 0.69               | 0.02  | .882 |
|                         | Error              | 16,894.47      | 541 | 31.23            |     |     |
|                         | Total              | 19,705.82      | 543 |                   |     |     |

Note. ANCOVA = analysis of covariance.

“A” Institution

Table 15 presents the result of the EE effect of institution “A.” The corrected posttest scores and standard deviations of the experimental groups among the high school students read as follows. Opportunity discovery is 24.28 (0.27); opportunity exploitation, 22.78 (0.22); entrepreneurship, 45.93 (0.00); creativity capacity, 42.49 (0.34); social problem solving, 28.12 (0.21); and entrepreneurial intention, 17.91 (0.31). The posttest scores and standard deviations of the control groups are slightly lower than the experimental ones: Opportunity discovery is 21.87 (0.27); opportunity exploitation, 20.82 (0.22); entrepreneurship, 45.93 (0.00); creativity capacity, 38.91 (0.34); social problem solving, 26.77 (0.21); and entrepreneurial intention, 16.32 (0.31).

As seen in Table 16, there were statistically significant differences in the corrected posttest scores adjusted for the covariate for all variables, except entrepreneurship. The ANCOVA results show that opportunity discovery ($F = 46.27, p < .001$), opportunity exploitation ($F = 39.17, p < .001$), creativity capacity ($F = 55.17, p < .001$), social problem solving ($F = 20.50, p < .001$), and entrepreneurial intention ($F = 12.88, p < .001$) showed significant differences. There was no significant difference in entrepreneurship.

The corrected posttest scores and standard deviations for the experimental groups of the middle school students were as follows (Table 17): opportunity discovery with 28.00 (0.44); opportunity exploitation with 24.50 (0.36); entrepreneurship with 53.94 (0.65); creativity capacity with 45.52 (0.64); social problem solving with 29.63 (0.37); and entrepreneurial intention with 20.94 (0.48). In contrast, the posttest scores and standard deviations for the control groups were lower for all variables compared with the experimental groups, and were as follows: opportunity discovery with 25.12 (0.44); opportunity exploitation with 22.51 (0.36); entrepreneurship with 49.97 (0.65); creativity capacity with 41.77 (0.64); social problem solving with 27.22 (0.37); and entrepreneurial intention with 18.53 (0.48).

The ANCOVA results for the middle school students showed statistically significant differences in the corrected
Table 15. Result of Differences Between the Pretest and Posttest Scores (High School Students).

| Variables               | Group              | N   | Pretest M (SD) | Posttest M (SD) | Corrected posttest M (SD) |
|-------------------------|--------------------|-----|---------------|-----------------|--------------------------|
| Opportunity discovery   | Experimental       | 220 | 21.27 (4.64)  | 24.11 (5.74)    | 24.48 (0.27)             |
|                         | Control            | 221 | 22.24 (5.38)  | 22.24 (5.38)    | 21.87 (0.27)             |
| Opportunity exploitation| Experimental       | 219 | 20.98 (4.16)  | 22.89 (4.74)    | 22.78 (0.22)             |
|                         | Control            | 221 | 20.72 (4.40)  | 20.72 (4.40)    | 20.82 (0.22)             |
| Entrepreneurial orientation  | Experimental   | 221 | 45.69 (7.56)  | 45.69 (7.56)    | 45.93 (0.00)             |
|                         | Control            | 221 | 46.16 (7.25)  | 46.16 (7.25)    | 45.93 (0.00)             |
| Creativity capacity     | Experimental       | 218 | 38.63 (6.15)  | 42.34 (7.69)    | 42.49 (0.34)             |
|                         | Control            | 221 | 39.07 (7.17)  | 39.07 (7.17)    | 38.91 (0.34)             |
| Social problem solving  | Experimental       | 220 | 26.83 (4.20)  | 28.16 (27.45)   | 28.12 (0.21)             |
|                         | Control            | 221 | 26.73 (4.30)  | 26.73 (4.30)    | 26.77 (0.21)             |
| Entrepreneurial intention| Experimental      | 220 | 15.79 (6.31)  | 17.60 (6.79)    | 17.91 (0.31)             |
|                         | Control            | 221 | 16.63 (6.43)  | 16.63 (6.43)    | 16.32 (0.31)             |

Table 16. ANCOVA Results for the Posttest Scores (Using the Pretest as the Covariate).

| Variables               | Source of variance                  | Sum of squares | df  | Average of squares | F     | p     |
|-------------------------|-------------------------------------|----------------|-----|--------------------|-------|-------|
| Opportunity discovery   | Covariance (pretest)                | 6,505.41       | 1   | 6,505.41           | 403.47| .000  |
|                         | Treatment                           | 746.06         | 1   | 746.06             | 46.27***| .000  |
|                         | Error                               | 7,062.26       | 438 | 16.12              |       |       |
|                         | Total                               | 250,751.00     | 441 |                    |       |       |
| Opportunity exploitation| Covariance (pretest)                | 4,425.78       | 1   | 4,425.78           | 409.02| .000  |
|                         | Treatment                           | 423.87         | 1   | 423.87             | 39.17***| .000  |
|                         | Error                               | 4,728.53       | 437 | 10.82              |       |       |
|                         | Total                               | 218,774.00     | 440 |                    |       |       |
| Entrepreneurial orientation| Covariance (pretest)               | 24,129.59      | 1   | 24,129.59          | 507.57| .000  |
|                         | Treatment                           | 0.00           | 1   | 0.00               |       |       |
|                         | Error                               | 0.00           | 439 | 0.00               |       |       |
|                         | Total                               | 956,393.00     | 442 |                    |       |       |
| Creativity capacity     | Covariance (pretest)                | 12,988.07      | 1   | 12,988.07          | 557.57| .000  |
|                         | Treatment                           | 1,411.79       | 1   | 1,411.79           | 55.17***| .000  |
|                         | Error                               | 11,156.79      | 436 | 25.59              |       |       |
|                         | Total                               | 752,250.00     | 439 |                    |       |       |
| Social problem solving  | Covariance (pretest)                | 4,592.28       | 1   | 4,592.28           | 469.62| .000  |
|                         | Treatment                           | 200.48         | 1   | 200.48             | 20.50***| .000  |
|                         | Error                               | 4,283.08       | 438 | 9.78               |       |       |
|                         | Total                               | 341,316.00     | 441 |                    |       |       |
| Entrepreneurial intention| Covariance (pretest)               | 9,801.97       | 1   | 9,801.97           | 456.03| .000  |
|                         | Treatment                           | 276.91         | 1   | 276.91             | 12.88***| .000  |
|                         | Error                               | 9,414.41       | 438 | 21.49              |       |       |
|                         | Total                               | 148,475.00     | 441 |                    |       |       |

Note. ANCOVA = analysis of covariance.

***p < .001.

posttest scores for all variables (Table 18): opportunity discovery ($F = 21.19, p < .001$), opportunity exploitation ($F = 50.66, p < .001$), entrepreneurship ($F = 15.79, p < .001$), creativity capacity ($F = 17.27, p < .001$), social problem solving ($F = 20.86, p < .001$), and entrepreneurial intention ($F = 12.38, p < .001$).

This study utilized quantitative techniques to analyze the impact of EE programs. Our findings provide convincing evidence that EE programs positively influenced students’ entrepreneurial competencies such as opportunity discovery, opportunity exploitation, entrepreneurship, creativity capacity, social problem solving, and entrepreneurial intention. Moreover, the Entship school (“N” institution) for middle school students did not significantly influence the four variables: opportunity discovery, opportunity exploitation, entrepreneurship, and entrepreneurial intention. Furthermore, the
Hero school (“A” institution) for high school students did not influence entrepreneurship.

**Conclusion**

Entrepreneurship has gained significance as a critical factor affecting economic growth. Many countries have institutionally supported the spread of EE. In recent years, not only universities but also secondary schools have implemented EE programs to improve entrepreneurial competencies. Several studies have revealed that EE positively influences entrepreneurial intention, the best predictor of the impact of EE. However, some scholars have criticized applying the same measurement regardless of growth stage or pedagogical method. Evaluations of the impact of EE can be divided into two main categories. The first category involves measuring

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### Table 17. Results of Differences Between the Pretest and Posttest Scores (Middle School Students).

| Variables           | Group           | N   | Pretest M (SD) | Posttest M (SD) | Corrected posttest M (SD) |
|---------------------|-----------------|-----|----------------|-----------------|---------------------------|
| Opportunity discovery | Experimental    | 187 | 24.44 (5.95)  | 28.04 (6.00)    | 28.00 (0.44)              |
|                     | Control         | 186 | 24.14 (5.37)  | 25.09 (6.37)    | 25.12 (0.44)              |
| Opportunity exploitation | Experimental | 186 | 22.26 (4.67)  | 24.53 (5.04)    | 24.50 (0.36)              |
|                     | Control         | 187 | 22.09 (4.70)  | 22.48 (5.05)    | 22.51 (0.36)              |
| Entrepreneurial orientation | Experimental | 187 | 49.93 (8.99)  | 54.05 (9.56)    | 53.94 (0.65)              |
|                     | Control         | 187 | 49.32 (8.17)  | 49.83 (9.43)    | 49.97 (0.65)              |
| Creativity capacity | Experimental    | 187 | 41.65 (8.06)  | 45.56 (8.76)    | 45.52 (0.64)              |
|                     | Control         | 187 | 41.37 (7.83)  | 41.73 (9.36)    | 41.77 (0.64)              |
| Social problem solving | Experimental | 187 | 27.22 (4.94)  | 29.61 (5.15)    | 29.63 (0.37)              |
|                     | Control         | 187 | 27.36 (4.73)  | 27.25 (5.47)    | 27.22 (0.37)              |
| Entrepreneurial intention | Experimental | 187 | 18.50 (6.53)  | 20.90 (6.85)    | 20.94 (0.48)              |
|                     | Control         | 187 | 19.01 (6.44)  | 18.57 (6.50)    | 18.53 (0.48)              |

### Table 18. ANCOVA Results for the Posttest Scores (Using the Pretest as the Covariate).

| Variables          | Source of variance | Sum of squares | df | Average of squares | F    | p     |
|--------------------|--------------------|----------------|----|--------------------|------|-------|
| Opportunity discovery | Covariance (pretest) | 718.87          | 1  | 718.87             | 19.71| .000  |
|                     | Treatment          | 772.63          | 1  | 772.63             | 21.19| .000  |
|                     | Error              | 13,492.49       | 370| 36.47              |      |       |
|                     | Total              | 278,263.00      | 373|                    |      |       |
| Opportunity exploitation | Covariance (pretest) | 736.00          | 1  | 736.00             | 31.28| .000  |
|                     | Treatment          | 371.78          | 1  | 371.78             | 15.79| .000  |
|                     | Error              | 8,707.05        | 370| 23.53              |      |       |
|                     | Total              | 215,846.00      | 373|                    |      |       |
| Entrepreneurial orientation | Covariance (pretest) | 11,747.91       | 1  | 11,747.91          | 147.61| .000  |
|                     | Treatment          | 4,031.86        | 1  | 4,031.86           | 50.66| .000  |
|                     | Error              | 1,487.44        | 1  | 1,487.44           | 18.69| .000  |
|                     | Total              | 29,526.13       | 371| 79.59              |      |       |
| Creativity capacity | Covariance (pretest) | 2,400.74        | 1  | 2,400.74           | 31.62| .000  |
|                     | Treatment          | 1,311.18        | 1  | 1,311.18           | 17.27| .000  |
|                     | Error              | 28,168.39       | 371| 75.93              |      |       |
|                     | Total              | 744,351.00      | 374|                    |      |       |
| Social problem solving | Covariance (pretest) | 849.18          | 1  | 849.18             | 32.71| .000  |
|                     | Treatment          | 541.62          | 1  | 541.62             | 20.86| .000  |
|                     | Error              | 9,632.01        | 371| 25.96              |      |       |
|                     | Total              | 313,248.00      | 374|                    |      |       |
| Entrepreneurial intention | Covariance (pretest) | 337.78          | 1  | 337.78             | 7.71 | .006  |
|                     | Treatment          | 542.56          | 1  | 542.56             | 12.38| .000  |
|                     | Error              | 16,264.40       | 371| 43.84              |      |       |
|                     | Total              | 162,779.00      | 374|                    |      |       |

Note. ANCOVA = analysis of covariance.

***p < .001.
the influence of EE actions on not only the intention to start a business but also the desirability and feasibility to do so (Karimi et al., 2014; Peterman & Kennedy, 2003). The second category analyzes the impact of EE actions on the attitudes toward entrepreneurs by assessing how educational experiences influence these attitudes (Athayde, 2009; Volery et al., 2013). However, these evaluator measures, such as EI and its antecedents, have tended to focus on adults, particularly university students. However, currently, adolescence is the more recommended period to begin the EE process. As Pittaway and Cope (2007) mentioned earlier, the development of more sophisticated indicators that consider EE programs’ learning goals and target audiences was required. Although few studies have measured the “soft” outcome of awareness education in adolescents, Athayde (2009) developed a scale for assessing the effectiveness of youth EE based on attitude theory. This study attempted to combine a review of entrepreneurship definitions and the general learning objectives of EE with the analysis of programs at two representative Korean institutions. We found that entrepreneurship has a rather broad definition that includes entrepreneurial mindsets and skillsets as well as entrepreneurial intentions, while EE sets its learning objectives based on the concept of entrepreneurship. Based on our findings, we identified six EE measures: entrepreneurial orientation (related to entrepreneurial mindset), opportunity discovery and opportunity exploitation (related to opportunity recognition), problem solving and creativity capacity (related to entrepreneurial skillsets), and entrepreneurial intention.

To analyze these variables using a rigorous methodology, we conducted pre- and posttests for the experimental and control groups. The results yielded some interesting findings. Overall, youth EE had a positive influence on all variables. EE programs enhanced various competencies related to entrepreneurship, creativity, and problem solving in adolescents. This suggests that EE can be a qualified alternative program for students to improve their creative and innovative competencies during the fourth industrial revolution. Most EE programs include lectures, practice, and small projects involving building a company or making a business model. This allows students to understand how business environments develop and what differences innovative entrepreneurs can make. Moreover, they give students an opportunity to think about people in trouble and try to solve these problems with their classmates.

This study has further implications. First, in the case of middle school students, the effectiveness of EE was not significant in Institution N, which conducted a 3-hr one-day workshop. In contrast, EE effectiveness was significant in Institution A, which conducted ten 2-hr instances of the regular program. This implies that adolescents need adequate time to understand the content and communicate with their instructors rather than a short-term education. This may suggest that short-term EE may not have a significant impact on adolescents. Second, comparing the results of Institution A’s programs on middle school and high school students (Tables 15 and 17), we found that all corrected posttest scores of middle school students were consistently higher than those of high school students. Notably, EE scores were not significant for the high school student group. This implies that, even within the same program, adolescents may experience a different magnitude of impact depending on their growth stage. This suggests that Institution A’s program was more suitable for middle school students than high school students. This finding indicates that Institution A’s EE program had insufficient content to promote entrepreneurial orientation at the high school level.

As such, the indicators of EE impact that reflect the learning objectives of EE program can be used as a useful means of examining the overall effectiveness of education, while simultaneously identifying problems and potential improvements. Although EE has been viewed as a crucial component to improving entrepreneurial intention, the outcomes of EE programs may differ depending on the curricula and target audiences. Further research is required for the continued development of indicators that cover the general learning objectives of EE programs.

Thus, this study has developed an elaborate EE effectiveness indicator based on prior study review, program analysis, and target audiences. It also contributes by meeting advanced methodological rigor standards that were required in previous research. From a practical point of view, this indicator can be used to diagnose the status of EE programs and suggest improvements.

This article has some limitations that should be addressed in future research. First, although we made an effort to achieve an accurate quasi-experimental design, including pre- and posttesting of comparison groups, the issue of non-probabilistic sampling remains, that is, the selection bias we mentioned earlier. Future studies require more careful experimental design, such as randomly setting up experimental and control groups. Second, this study did not consider the quality of instructors and the different pedagogical approaches. Although the connection between instructors and students, or teaching style, is an important factor that influences the impact of EE programs, these exogenous variables were not controlled in this article. Third, the findings regarding the impact of EE only apply to South Korea. Future research should be multinational studies that consider the differences in cultures, education, and subjects across countries. Fourth, pre- and posttests have been performed in this study; however, long-term follow-up is necessary to ensure accuracy of the results.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.
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