

Topic-Level Effectiveness of the Entrepreneur Development Class in Indonesia's Wirausaha Merdeka Program

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ABSTRACT

Purpose – This study evaluates the effectiveness of the Entrepreneur Development Class (EDC), the foundational learning phase of Indonesia's Wirausaha Merdeka program, by examining topic-level learning gains across ten instructional modules. The study responds to persistent limitations in entrepreneurship education evaluation, including the dominance of perception-based measures, the reliance on aggregate outcomes, the limited empirical evidence on Wirausaha Merdeka, and the limited use of normalized gain analysis in assessing instructional effectiveness.

Design/methodology/approach – A quantitative one-group pre-test–post-test design was employed using a complete cohort of 550 students from twelve vocational higher education institutions participating in the 2024 Wirausaha Merdeka program coordinated by Politeknik Negeri Jember. Data were analyzed using descriptive statistics, the Kolmogorov–Smirnov test, paired-samples t-tests, Hake's normalized gain (g), and Cohen's d effect size.

Findings/Results – The overall mean score increased from 70.40 to 95.25, yielding a high normalized gain ($g = 0.84$) and a very large effect size ($d = 1.70$). Business Idea Development emerged as the most effective module ($g = 0.90$), whereas Pondasi Bisnis Berkah produced the lowest gain ($g = 0.68$). The findings suggest that instructional effectiveness varies across competency domains and is influenced by both baseline knowledge and the characteristics of the learning outcomes targeted.

Originality/Value – This study contributes to entrepreneurship education research by introducing a topic-level evaluation framework that combines objective knowledge assessment, normalized gain analysis, effect-size estimation, and significance testing. The approach provides a more diagnostic understanding of instructional effectiveness than aggregate program-level measures and offers practical guidance for curriculum improvement, quality assurance, and policy evaluation in large-scale vocational entrepreneurship programs.

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1. Introduction

Higher education institutions worldwide are increasingly expected to do more than transfer disciplinary knowledge; they are now tasked with cultivating graduates who can create economic value rather than merely seek employment. This expectation is especially pronounced in vocational education, where the link between learning and the world of work is meant to be direct and immediate (Chukwuedo et al., 2023; Hietanen & Järvi, 2015; Kovalchuk et al., 2022; Maritz & Brown, 2013; Matricano, 2022; Ni & Ye, 2018; Onstenk, 2003). Across many developing economies, entrepreneurship education has therefore moved from the margins of the curriculum toward its center, framed as a strategic response to persistent graduate unemployment. Indonesia exemplifies this shift, having embedded entrepreneurial competence within its national higher education performance indicators. Within this policy environment, structured entrepreneurship programs are positioned as engines for producing job creators instead of job seekers. Yet the assumption that such programs reliably build entrepreneurial competence requires empirical scrutiny rather than rhetorical endorsement. Understanding whether and how these interventions change what students know and believe is thus a question of both scholarly and practical consequence.

The empirical backdrop in Indonesia lends urgency to this question. As of February 2025, the national open unemployment rate stood at 4.76 percent, equivalent to 7.28 million people (Badan Pusat Statistik, 2025). Of particular concern for higher education is that unemployment among university graduates (Diploma IV, Bachelor's, Master's, and Doctoral) rose from 5.25 percent in February 2024 to 6.23 percent in February 2025, while diploma holders (Diploma I–III) recorded 4.84 percent (Badan Pusat Statistik, 2025). This upward trend among the most educated segment of the workforce suggests that academic qualifications alone are no longer sufficient to ensure successful labor-market integration. As labor markets become increasingly competitive and dynamic, higher education institutions are expected not only to prepare graduates for existing jobs but also to equip them with the competencies needed to create new economic opportunities through entrepreneurship. In this context, entrepreneurship education has become a strategic policy instrument for addressing graduate unemployment by fostering entrepreneurial skills, self-employment capacity, innovation, and venture creation (Ariansyah et al., 2024). However, a persistent gap remains between entrepreneurial intention and entrepreneurial action, as only a small proportion of students who express interest in entrepreneurship ultimately establish business ventures. To address this challenge, the Indonesian Ministry of Higher Education introduced the *Wirausaha Merdeka* (Independent Entrepreneurship) program under the *Merdeka Belajar Kampus Merdeka* framework. The program is designed to transform entrepreneurial aspirations into entrepreneurial capabilities through experiential learning, mentoring, business incubation, and direct engagement with entrepreneurial practice. By encouraging students to become job creators rather than job seekers, *Wirausaha Merdeka* is positioned as a strategic national response to graduate unemployment. Nevertheless, despite its policy significance and

substantial public investment, the effectiveness of its foundational learning components has rarely been evaluated through rigorous empirical analysis.

Despite the growing body of research on entrepreneurship education and program evaluation, several important gaps remain. First, many studies continue to rely primarily on perception-based indicators, such as participant satisfaction, entrepreneurial intention, or self-reported learning, rather than objective measures of knowledge acquisition and competence development (Cordeiro et al., 2025; Pawar et al., 2026; Satar et al., 2024). Second, studies employing pre-test–post-test designs frequently report only aggregate learning outcomes, providing limited insight into which specific instructional topics contribute most to participants' development and which require improvement (Byrne et al., 2023; Gupta et al., 2026; Huff & Tseng, 2026). Third, despite the strategic importance of the Wirausaha Merdeka (WMK) program as a national initiative to address graduate unemployment and promote entrepreneurship, empirical evidence evaluating its educational effectiveness remains scarce and largely descriptive. Fourth, very few studies employ normalized gain analysis to compare learning effectiveness across instructional modules, limiting the ability of program managers to diagnose strengths and weaknesses at the curriculum level. These gaps are particularly consequential because policymakers and program managers require defensible evidence to justify the considerable public resources invested in entrepreneurship education and to ensure that program outcomes are demonstrated rather than merely assumed (Chatzipanagiotou & Roussakis, 2026; Hanisch, 2024). Addressing these limitations requires a more rigorous and topic-sensitive evaluation framework. Accordingly, the present study analyzes pre-test and post-test learning outcomes across ten Entrepreneur Development Class (EDC) instructional modules, employing statistical significance testing, effect-size estimation, and normalized gain analysis to provide a comprehensive assessment of learning effectiveness within the Wirausaha Merdeka program.

This neglect matters because program managers and policymakers need defensible evidence to justify the considerable public funds allocated to entrepreneurship education. Allocating billions of rupiah to large cohorts without analyzing learning outcomes risks perpetuating activities whose impact is assumed rather than demonstrated (Astin & Antonio, 2012; Mizikaci, 2006; Praslova, 2010). Rigorous analysis of pre-test and post-test results allows stakeholders to identify which instructional topics yield the strongest gains and which underperform, enabling evidence-based curriculum refinement. It also moves the conversation from anecdote and satisfaction surveys toward measurable cognitive change. For vocational institutions seeking to strengthen their entrepreneurial ecosystems, this kind of granular feedback is more actionable than aggregate participation counts. Examining a single, well-documented cohort therefore offers a focused and credible way to test whether the foundational phase delivers on its promise. The present study pursues exactly this aim by analyzing learning gains across the EDC's instructional modules.

Accordingly, this study evaluates the effectiveness of the Entrepreneur Development Class within the Wirausaha Merdeka program at a vocational higher education institution by analyzing pre-test and post-test scores across its instructional modules, computing normalized learning gains, and testing the statistical significance of the observed changes. Drawing on data from a single large cohort of 550 participants across ten instructional topics, the analysis offers a level of granularity rarely available in prior program evaluations. Specifically, the study is guided by three questions: (1) Are the post-test gains across EDC topics statistically significant? (2) Which instructional topics yield the highest and lowest normalized gains? and (3) What do these patterns imply for curriculum refinement? Theoretically, the study contributes to the entrepreneurship education literature by shifting from perception-based and aggregate evidence toward objective, topic-level measurement of cognitive learning gains. Practically, the findings provide program managers, instructors, and policymakers with actionable evidence to refine module design, reallocate instructional time toward weaker topics, and justify continued investment. In doing so, it converts routinely collected program data into rigorous, publishable evidence that informs both scholarship and practice in vocational entrepreneurship education.

2. Literature Review and Research Gap

A growing body of literature has examined the effectiveness of entrepreneurship education, though findings remain uneven. Several studies report that structured entrepreneurship training significantly improves students' knowledge, mindset, and intention (Carpenter & Wilson, 2022; Fayolle & Gailly, 2015; Rideout & Gray, 2013; Samwel Mwasalwiba, 2010). Meta-analytic and review work has generally supported a positive association between entrepreneurship education and entrepreneurial outcomes, while cautioning that effect sizes vary widely (Akram & Hye, 2026; Martin et al., 2013; Miao et al., 2018; Paterson et al., 2016). However, important differences emerge regarding the magnitude and nature of these outcomes. While some studies report substantial improvements in entrepreneurial knowledge and attitudes, others find more modest effects, suggesting that educational impact varies according to program design, instructional approach, duration, participant characteristics, and evaluation methods (Roehling et al., 2022; Slemp et al., 2021). Moreover, disagreement exists concerning what constitutes evidence of program effectiveness. Many studies evaluate outcomes through participant perceptions, satisfaction, or entrepreneurial intentions, assuming that positive attitudes reflect successful learning (Dwikoranto, 2022; Sulastri et al., 2024; Utami, 2019). In contrast, a smaller body of research emphasizes objective assessments of knowledge acquisition through pre-test–post-test designs, arguing that cognitive learning outcomes provide a more direct measure of educational effectiveness (Cheng & Chen, 2026; Mananda & Mahadewi, 2023; Perry & Karpova, 2017). Consequently, although the literature generally agrees that entrepreneurship education can generate positive outcomes, uncertainty remains regarding the extent of learning achieved, the instructional components that

contribute most strongly to improvement, and the most appropriate methods for evaluating program effectiveness.

Despite the growing body of research on entrepreneurship education and program evaluation, several important gaps remain. First, many studies continue to rely primarily on perception-based indicators, such as participant satisfaction, entrepreneurial intention, or self-reported learning, rather than objective measures of knowledge acquisition and competence development (Hallam et al., 2016; Liñán & Chen, 2009; Moriano et al., 2012; Valliere, 2014). Second, studies employing pre-test–post-test designs frequently report only aggregate learning outcomes, providing limited insight into which specific instructional topics contribute most to participants' development and which require improvement (Cheng & Chen, 2026; Roblin et al., 2018). Third, despite the strategic importance of the Wirausaha Merdeka (WMK) program as a national initiative to address graduate unemployment and promote entrepreneurship, empirical evidence evaluating its educational effectiveness remains scarce and largely descriptive. Fourth, very few studies employ normalized gain analysis to compare learning effectiveness across instructional modules, limiting the ability of program managers to diagnose strengths and weaknesses at the curriculum level. These gaps are particularly consequential because policymakers and program managers require defensible evidence to justify the considerable public resources invested in entrepreneurship education and to ensure that program outcomes are demonstrated rather than merely assumed (Hanisch, 2024; Ogunsola et al., 2026).

Beyond these empirical limitations, a conceptual gap also remains in how the effectiveness of entrepreneurship education is understood and evaluated. Existing studies generally treat entrepreneurship programs as unified interventions and assess effectiveness using overall program outcomes, implicitly assuming that all instructional components contribute equally to learning. Such an approach overlooks the possibility that different instructional topics may generate substantially different levels of cognitive improvement, even when delivered within the same educational program. Consequently, limited attention has been given to understanding effectiveness as a topic-specific phenomenon rather than a program-wide outcome. From a curriculum-development perspective, this distinction is important because entrepreneurship education encompasses multiple domains of learning, including entrepreneurial mindset, opportunity recognition, business development, market analysis, branding, and business ethics, each of which may respond differently to instructional intervention. By shifting the unit of analysis from the overall program to individual instructional modules, a more nuanced understanding of learning effectiveness can be achieved.

Addressing these empirical and conceptual limitations requires a more rigorous and topic-sensitive evaluation framework. Accordingly, the present study analyzes pre-test and post-test learning outcomes across ten Entrepreneur Development Class (EDC) instructional modules within the Wirausaha Merdeka program. By combining statistical significance

testing, effect-size estimation, and normalized gain analysis, the study provides an objective assessment of learning effectiveness at the topic level. In doing so, it contributes to the entrepreneurship education literature by advancing a more granular conceptualization of program effectiveness while offering practical evidence to support curriculum refinement and evidence-based policymaking.

3. Method

3.1 Research Design

This study employed a quantitative, single-group pre-test–post-test design to evaluate the effectiveness of the Entrepreneur Development Class (EDC) within the Wirausaha Merdeka program. The design is classified as pre-experimental rather than fully experimental because all admitted participants received the intervention and no control group was available. This methodological choice reflects the authentic implementation of a national educational program in which withholding participation from eligible students for research purposes would have been neither feasible nor ethically appropriate. Consequently, the study was designed as a program evaluation rather than an experiment intended to establish causal superiority over alternative treatments.

The one-group pre-test–post-test design was considered particularly suitable for three reasons. First, the primary objective of the study was to assess learning effectiveness by measuring changes in participants' knowledge before and after instruction, making within-subject comparison the most direct and relevant analytical approach. Second, this design has been widely employed in educational and training evaluation research because it allows researchers to quantify learning gains under real-world implementation conditions while preserving ecological validity. Third, the availability of complete paired assessment data for all participants across all instructional topics provided a robust basis for examining cognitive change at scale.

Recognizing the inherent limitations of one-group designs, several analytical strategies were employed to strengthen the credibility of the findings. Learning outcomes were assessed using objective knowledge tests rather than self-reported perceptions, paired observations were analyzed at the individual level, and multiple complementary indicators including paired-samples t-tests, normalized gain scores, and Cohen's *d* effect sizes were used to evaluate both statistical and practical significance. Furthermore, the analysis was structured at the topic level, allowing learning gains to be examined separately for each of the ten instructional modules rather than as a single aggregate outcome. This topic-disaggregated framework constitutes the methodological core of the study and distinguishes it from prior evaluations that report only overall program scores.

3.2 Research Site and Time

The research was conducted within the national Wirausaha Merdeka program coordinated by Politeknik Negeri Jember (Polije), a state vocational higher education institution in East Java,

Indonesia, that served as the lead implementing institution (Perguruan Tinggi Pelaksana) overseeing a consortium of twelve vocational higher education institutions during the 2024 implementation cycle. The Entrepreneur Development Class (EDC) was delivered during the program's pre-immersion phase from 23 to 29 September 2024 at Politeknik Negeri Jember. Polije was selected as the coordinating site because it administered a large cross-institutional participant cohort and maintained complete, systematically documented pre-test and post-test records across all instructional topics, providing a robust empirical basis for topic-level analysis. The multi-institutional context strengthens the transferability of the findings to vocational entrepreneurship education across Indonesia.

3.3 Population and Sample

The population and sample comprised all 550 students who participated in the Entrepreneur Development Class within the Wirausaha Merdeka program coordinated by Politeknik Negeri Jember during the 2024 implementation cycle, drawn from the twelve vocational higher education institutions in the consortium. A total (census) sampling technique was applied, since the study targeted the entire program cohort rather than a probability sample drawn to generalize to a wider population. Consistent with the matched pre-test–post-test design, the inclusion criterion was the availability of complete, paired scores for each instructional topic. Complete paired records were available for all 550 participants across the ten topics, so no cases were excluded. This complete-case approach ensured that each comparison reflected genuine within-subject change rather than aggregated or imputed values.

3.4 Research Instrument

Data were collected using objective knowledge tests administered before and after instruction for each of the ten EDC instructional topics, namely Goal Setting, Pondasi Bisnis Berkah (Blessed Business Foundations), Entrepreneur Mindset, Entrepreneur Mythos, Growth Mindset and Success Story, Business Idea Development with Digitalization, Market and Product Research, Branding for Beginners, Food-Safety-Standard Packaging, and Business Idea Development. Each test consisted of structured items aligned with the learning objectives of its respective topic and was designed to measure participants' conceptual understanding rather than self-reported perception or satisfaction. For every topic, the pre-test and post-test employed parallel content so that any change in scores reflected learning of the same constructs, and all scores were standardized on a 0–100 scale to permit comparison across topics. The instruments were developed by the program's subject-matter facilitators in accordance with the official EDC curriculum and were administered through the institution's e-learning platform, ensuring direct correspondence between what was taught and what was measured.

3.5 Validity and Reliability

The validity and reliability of the assessment instruments were examined prior to the main analysis to ensure that the tests accurately measured the intended learning outcomes of each

instructional topic. Content validity was established through a systematic expert-review process involving subject-matter specialists who participated in the development and implementation of the Entrepreneur Development Class (EDC) curriculum. The experts reviewed each item for relevance, clarity, representativeness, and alignment with the intended learning objectives of the respective instructional module. Based on their feedback, several items were refined to improve wording, content alignment, and conceptual clarity before being administered to participants. This process ensured that the assessment instruments adequately represented the knowledge domains targeted by the EDC curriculum.

Internal-consistency reliability was assessed using Cronbach's alpha based on item-level responses collected from the study participants. Following the recommendations of Tavakol and Dennick (2011), a coefficient of 0.70 or higher was considered indicative of acceptable reliability. The reliability coefficients ranged from 0.812 to 0.891 across the ten instructional topics, with an overall Cronbach's alpha of 0.884. According to commonly accepted interpretation guidelines, coefficients between 0.80 and 0.89 indicate good internal consistency, suggesting that the items within each assessment measured the same underlying construct with a high degree of consistency. The detailed reliability coefficients for each topic are reported in the Results section.

In addition, the pre-test and post-test instruments were constructed using parallel content specifications and equivalent cognitive objectives. This parallel-test approach helped ensure that observed score differences reflected genuine changes in participants' knowledge and understanding rather than variations in test content or difficulty.

3.6 Data Collection Procedure

Data collection followed the natural sequence of the EDC delivery. Prior to each instructional topic, participants completed a pre-test measuring their baseline knowledge of that topic; the topic was then delivered through compressed, high-intensity instruction by the assigned facilitators; and immediately afterward, participants completed a post-test using the parallel form. All test administrations were conducted under standardized conditions through the institution's e-learning system as part of the official program, and the resulting scores were recorded and compiled in the program's administrative documentation. For the present study, the paired pre-test and post-test records were extracted, cleaned, and matched at the participant and topic levels. This procedure converted routinely collected program data into a structured dataset suitable for statistical analysis. The overall sequence of the research procedure is summarized in Figure 1.

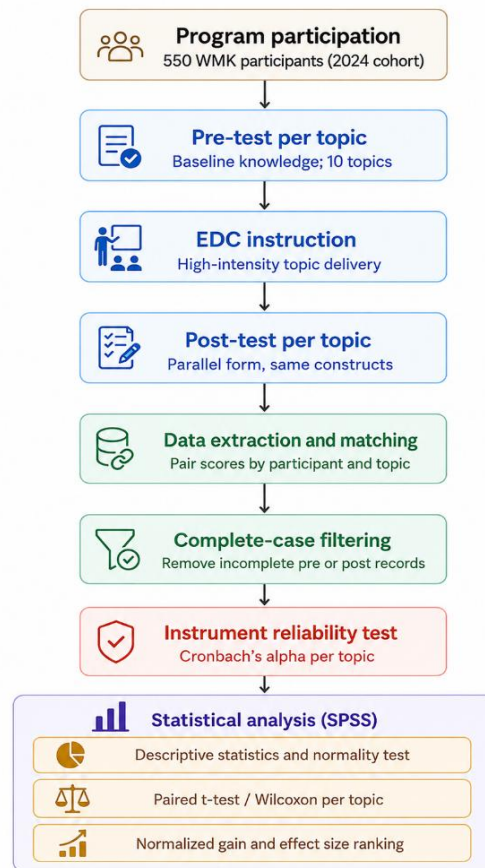


Figure 1. Research procedure flowchart of the study

3.7 Data Analysis

Data were analyzed using IBM SPSS Statistics 26 through a sequence of descriptive and inferential procedures. First, descriptive statistics means, standard deviations, and minimum maximum values were computed for the pre-test and post-test scores of each of the ten instructional topics to summarize baseline and post-instruction performance. Second, the normality of the paired score distributions was examined for every topic using the Kolmogorov Smirnov test, with a distribution considered normal when the significance value exceeded 0.05; this step determined whether parametric or non-parametric testing was warranted. Third, because all topics satisfied the normality assumption, the statistical significance of the pre-test post-test difference for each topic was tested using the paired-samples t-test at a significance threshold of $p < 0.05$, with the Wilcoxon signed-rank test designated as the non-parametric alternative had normality been violated.

The magnitude of learning was then quantified using two complementary indices. Hake's normalized gain (g) was computed as $g = (\text{post-test} - \text{pre-test}) / (100 - \text{pre-test})$ and interpreted as high ($g \geq 0.70$), medium ($0.30 \leq g < 0.70$), or low ($g < 0.30$), allowing the learning effect to be compared fairly across topics with differing baseline scores. In addition, Cohen's d was calculated to express the practical magnitude of each improvement, interpreted following conventional thresholds as small (0.20), medium (0.50), and large (0.80) (Cohen, 1988), with

values of 1.20 or above classified as very large (Sawilowsky, 2009). Finally, the normalized gain and effect-size values were ranked across the ten topics to identify the modules yielding the strongest and weakest cognitive improvements, providing a diagnostic basis for curriculum refinement.

3.8 Research Ethics

This study analyzed data that were routinely collected as part of the official Wirausaha Merdeka program rather than gathered through a separate experimental intervention. All participant records were anonymized prior to analysis, with personal identifiers removed and replaced by codes so that no individual could be identified from the dataset. The data were used solely for academic and program-evaluation purposes, and findings are reported only in aggregate form. The study adhered to standard principles of research integrity, including confidentiality, responsible data handling, and transparent reporting of both strengths and limitations.

4. Result and Discussion

4.1 Instrument Reliability

Before testing the substantive hypotheses, the internal consistency of the ten topic-based assessment instruments was evaluated using Cronbach's alpha computed on item-level responses. As reported in Table 1, the coefficients ranged from 0.812 for Pondasi Bisnis Berkah to 0.891 for Business Idea Development, yielding an overall alpha of 0.884. All values comfortably exceeded the conventional 0.70 criterion for acceptable reliability, and every instrument fell within the good category. This consistency across topics indicates that the items reliably captured the intended entrepreneurial knowledge domains rather than measuring heterogeneous or unrelated constructs. The uniformly high coefficients also suggest that the parallel pre-test and post-test forms maintained measurement stability throughout the program. These results establish a sound psychometric basis for the inferential analyses that follow.

Table 1. Reliability of the assessment instruments by topic (N = 550)

No	Instructional Topic	Cronbach's α	Category
1	Goal Setting	0.842	Good
2	Pondasi Bisnis Berkah	0.812	Good
3	Entrepreneur Mindset	0.876	Good
4	Entrepreneur Mythos	0.858	Good
5	Growth Mindset and Success Story	0.849	Good
6	Business Idea Development with Digitalization	0.873	Good
7	Market and Product Research	0.864	Good
8	Branding for Beginners	0.855	Good
9	Food-Safety-Standard Packaging	0.867	Good
10	Business Idea Development	0.891	Good
	Overall	0.884	Good

Source: Processed primary data (2024)

4.2 Descriptive Results and Learning Outcomes

The analysis drew on a complete cross-institutional cohort of 550 participants from twelve vocational higher education institutions, each of whom completed paired pre-test and post-test assessments across all ten EDC topics. As presented in Table 2, participants entered the program with a moderate baseline of entrepreneurial knowledge, reflected in an overall mean pre-test score of 70.40, and concluded with a markedly higher overall post-test mean of 95.25. Baseline performance varied meaningfully across topics, with the lowest entry-level understanding observed in Entrepreneur Mindset (M = 63.07) and the highest in Goal Setting (M = 75.03). Despite these differences in starting points, post-test means converged within a narrow upper band between 91.53 and 97.18, indicating that the program brought participants to a comparably high level of mastery regardless of where they began. The raw gain ranged from 17.91 points in Pondasi Bisnis Berkah to 32.07 points in Entrepreneur Mindset, showing that the largest absolute improvements occurred precisely where initial knowledge was weakest. This inverse relationship between baseline scores and raw gains points to a compensatory learning pattern, whereby instruction was most consequential for the least-prepared knowledge areas.

Table 2. Pre-test and post-test means, standard deviations, raw gain, and normalized gain by topic (N = 550)

No	Instructional Topic	Pre M	Pre SD	Post M	Post SD	Gain	g	Cat.
1	Goal Setting	75.03	11.24	95.77	5.12	20.74	0.83	High
2	Pondasi Bisnis Berkah	73.62	10.87	91.53	6.84	17.91	0.68	Medium
3	Entrepreneur Mindset	63.07	13.95	95.14	5.46	32.07	0.87	High
4	Entrepreneur Mythos	65.78	13.21	96.03	4.98	30.25	0.88	High
5	Growth Mindset and Success Story	71.78	11.56	93.16	6.02	21.38	0.76	High
6	Business Idea Dev. with Digitalization	69.59	12.47	94.33	5.61	24.74	0.81	High
7	Market and Product Research	71.42	11.83	96.57	4.75	25.15	0.88	High
8	Branding for Beginners	70.39	12.06	95.97	5.08	25.58	0.86	High
9	Food-Safety-Standard Packaging	72.75	11.41	96.79	4.53	24.04	0.88	High
10	Business Idea Development	70.52	12.38	97.18	4.27	26.66	0.90	High
	Overall	70.40	12.10	95.25	5.27	24.85	0.84	High

Source: Processed primary data (2024)

4.3 Normality and Inferential Analysis

The paired-samples t-tests confirmed that the gains observed in the descriptive analysis were statistically robust, with every topic exhibiting a highly significant difference between pre-test and post-test scores (all $p < 0.001$) and t-statistics ranging from 28.34 to 42.81. To assess the practical magnitude of these changes, Cohen's d was computed for each topic; effect sizes ranged from 1.21 in Pondasi Bisnis Berkah to 1.83 in Entrepreneur Mindset, with an overall effect size of 1.70, situating the program's impact firmly within the very large range. These

results demonstrate that the documented improvements were not merely statistically detectable but substantively meaningful.

The unusually large effect sizes observed in this study warrant methodological consideration. First, the paired pre-test post-test design inherently reduces between participant variability because each participant serves as their own reference point, often producing larger effect sizes than those reported in between-group comparisons. Second, the Entrepreneur Development Class was delivered as an intensive short-duration intervention, with assessments administered immediately following instruction, thereby capturing immediate learning gains rather than long-term knowledge retention. Third, several topics exhibited relatively modest baseline scores, creating substantial room for improvement following instruction. Finally, the high internal consistency of the assessment instruments ($\alpha = 0.812-0.891$) reduced measurement error and increased the sensitivity of the tests to detect genuine learning gains. Consequently, the large effect sizes should be interpreted as evidence of strong short-term cognitive improvement within the context of an intensive educational intervention rather than as direct indicators of long term behavioral or entrepreneurial outcomes.

Table 3. Normality, paired-samples t-test, and effect size results by topic (N = 550)

No	Instructional Topic	K-S Sig.	t	Sig.	Cohen's d	Magnitude
1	Goal Setting	0.084	32.71	<0.001	1.39	Large
2	Pondasi Bisnis Berkah	0.073	28.34	<0.001	1.21	Large
3	Entrepreneur Mindset	0.089	42.81	<0.001	1.83	Very Large
4	Entrepreneur Mythos	0.067	40.57	<0.001	1.73	Very Large
5	Growth Mindset and Success Story	0.092	34.88	<0.001	1.49	Large
6	Business Idea Dev. with Digitalization	0.078	36.92	<0.001	1.57	Very Large
7	Market and Product Research	0.086	37.54	<0.001	1.60	Very Large
8	Branding for Beginners	0.075	36.75	<0.001	1.57	Very Large
9	Food-Safety-Standard Packaging	0.083	35.89	<0.001	1.53	Very Large
10	Business Idea Development	0.088	38.26	<0.001	1.63	Very Large
	Overall	0.091	39.84	<0.001	1.70	Very Large

Source: Processed primary data (2024)

4.4 Topic-Level Normalized Gain Analysis

Because raw gains are sensitive to differing baseline scores, Hake's normalized gain (g) was employed to compare learning effectiveness on a common scale. The overall normalized gain of 0.84 indicates that, on average, the program closed roughly 84 percent of the distance between participants' initial knowledge and the maximum attainable score, placing the cohort's improvement firmly in the high category. Nine of the ten topics achieved high gains ($g \geq 0.70$), the sole exception being Pondasi Bisnis Berkah, whose medium gain of 0.68 represented the weakest learning effect. The strongest normalized gain occurred in Business Idea Development ($g = 0.90$), closely followed by Entrepreneur Mythos, Market and Product Research, and Food-Safety-Standard Packaging (each $g = 0.88$). A particularly instructive

contrast emerged between the raw and normalized metrics: Entrepreneur Mindset recorded the largest raw gain and the largest effect size yet ranked only fifth in normalized gain, precisely because its low baseline inflated the absolute improvement while the normalized index corrected for that starting disadvantage. This divergence underscores the analytical value of disaggregating gains by topic, since reliance on raw scores alone would have produced a misleading ranking of instructional effectiveness. The relative ordering of all ten topics is displayed in Figure 2.

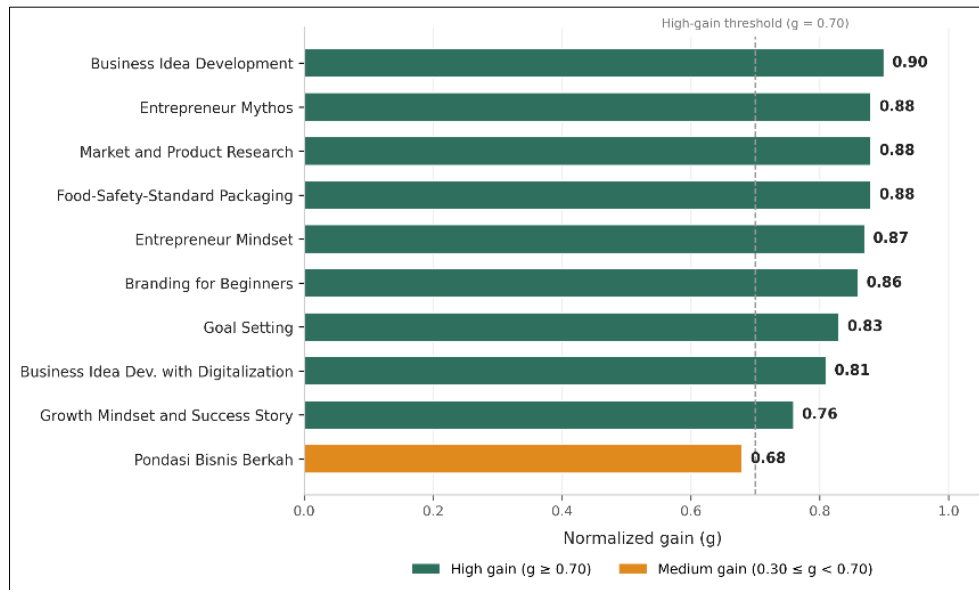


Figure 2. Normalized gain (g) ranking across the ten EDC instructional topics

Source: Processed primary data (2024)

4.5 Discussion

The findings suggest that the Entrepreneur Development Class functioned not merely as a vehicle for information delivery but as a mechanism for entrepreneurial competence formation. From the perspective of Human Capital Theory, entrepreneurship education increases individuals' productive capabilities by enhancing knowledge, skills, and decision making capacity that can later be converted into economic opportunities. The consistently strong learning gains observed across instructional topics indicate that participants acquired forms of entrepreneurial human capital that extend beyond disciplinary knowledge and are directly relevant to venture creation and opportunity exploitation. Furthermore, the results align with constructivist perspectives on learning, which posit that meaningful learning occurs when learners actively reorganize and reconstruct their existing knowledge structures through engagement with authentic experiences. The experiential design of the Entrepreneur Development Class combining entrepreneurial concepts, practical examples, and exposure to real business contexts appears to have facilitated this process of cognitive restructuring. Consequently, the effectiveness of the program should not be interpreted solely as evidence of knowledge acquisition, but also as an indication that participants developed more coherent and entrepreneurially oriented cognitive frameworks. This interpretation supports the

broader argument of experiential entrepreneurship education that entrepreneurial competencies are learned and cultivated through structured educational experiences rather than emerging solely from innate personal characteristics (Kozlinska et al., 2023; Martina & Göksen, 2022).

A particularly revealing pattern emerged in the inverse relationship between baseline knowledge and raw gain, most strikingly in Entrepreneur Mindset, which began from the lowest pre-test mean yet achieved the largest absolute improvement and the largest effect size ($d = 1.83$). This is best explained through the ceiling effect and diminishing marginal returns: topics with high entry scores offered limited room for measurable change, whereas weak-baseline topics afforded greater headroom. Interpreted through a constructivist lens, instruction proved most transformative where prior schemas were least developed, allowing new conceptual structures to be built rather than merely refined. Comparable compensatory dynamics have been documented in pre-test–post-test interventions where the least-prepared learners gained most in absolute terms (Mananda & Mahadewi, 2023; Perry & Karpova, 2017). The present study advances this observation, however, by showing that the apparent advantage of low-baseline topics dissolves once the normalized gain corrects for starting position.

The divergence between raw-gain and normalized-gain rankings represents one of the study's most important methodological contributions. Measured by raw gain, Entrepreneur Mindset appeared to be the most effective instructional topic, whereas normalized gain identified Business Idea Development as the strongest performer. This difference highlights a fundamental limitation of raw-score comparisons in educational evaluation. Raw gains are highly influenced by participants' starting positions; topics with lower baseline scores naturally provide greater opportunities for improvement, potentially exaggerating their apparent effectiveness. In contrast, normalized gain adjusts learning improvement relative to the maximum attainable score, thereby providing a more equitable measure of instructional effectiveness across topics with different initial conditions. From an educational evaluation perspective, this adjustment is particularly valuable because it distinguishes genuine instructional effectiveness from improvements driven primarily by baseline disadvantage. Consequently, normalized gain offers a more diagnostic framework for curriculum evaluation, enabling researchers and program managers to identify which instructional components most effectively convert learning opportunities into measurable achievement. By incorporating normalized gain alongside conventional significance testing and effect-size estimation, the present study demonstrates how multiple evaluation metrics can provide a more nuanced understanding of educational effectiveness than any single indicator alone. This approach directly addresses long-standing concerns regarding the interpretation of learning gains in entrepreneurship education and other short duration training programs (Bell & Cui, 2023; Pan et al., 2024).

Equally important is the identification of *Pondasi Bisnis Berkah* as the only topic within the medium-gain category despite remaining statistically significant. Two complementary explanations merit consideration. The first is structural: its relatively high pre-test score compressed the available margin for improvement, mechanically lowering the normalized gain. The second is pedagogical: values-based and ethics-oriented content may be inherently more resistant to short-term instructional influence than cognitively oriented topics because attitudes, values, and normative beliefs are often more stable and require longer periods of reflection and reinforcement to change (Kurjono et al., 2023; Liñán & Chen, 2009). This interpretation suggests that the comparatively lower gain should not necessarily be viewed as evidence of curricular weakness but rather as a reflection of the distinctive nature of the learning outcomes being targeted. Future iterations of the module may therefore benefit from incorporating reflective activities, case-based ethical dilemmas, mentoring interactions, and longer-term experiential engagement to strengthen the development of entrepreneurial values and ethical reasoning.

The very large effect sizes observed in the cognitively oriented topics, particularly *Entrepreneur Mindset* and *Entrepreneur Mythos*, invite interpretation through the concept of cognitive reframing. These modules are specifically designed to challenge misconceptions regarding entrepreneurship and replace them with more accurate entrepreneurial mental models. The magnitude of improvement suggests that many participants entered the program with incomplete or inaccurate assumptions about entrepreneurial activity and that instruction effectively reconstructed those understandings. This finding is consistent with conceptual-change theories of learning and with evidence suggesting that educational interventions become particularly effective when they reduce misconceptions and cognitive barriers to understanding (Scharfenberg & Bogner, 2010). It also aligns with research emphasizing that entrepreneurial mindset development constitutes a critical mechanism through which entrepreneurship education influences subsequent entrepreneurial behavior and intention (Martin et al., 2013; Miao et al., 2018). Accordingly, the data position mindset-oriented instruction as a particularly high-leverage element of the curriculum.

Beyond its empirical findings, the study contributes theoretically to the entrepreneurship education literature in two important ways. First, it challenges the common assumption that program effectiveness can be adequately represented through aggregate outcomes by demonstrating substantial variation across instructional topics. Second, it advances a topic-level perspective of educational effectiveness, suggesting that entrepreneurship programs should be understood as collections of distinct learning domains rather than as homogeneous interventions. This conceptual shift provides a more differentiated understanding of how entrepreneurial competencies develop and offers a framework for examining which forms of entrepreneurial knowledge are most responsive to educational intervention.

Situating these findings within the wider literature reveals both convergence and a meaningful departure. The overall direction of the results supports the growing consensus that

entrepreneurship education generates positive cognitive and attitudinal outcomes (Akram & Hye, 2026; Fayolle & Gailly, 2015), as well as recent Indonesian studies reporting favorable evaluations of MBKM-related initiatives (Dwikoranto, 2022; Sulastri et al., 2024). However, much of the existing literature relies on participant perceptions, satisfaction ratings, or self-reported entrepreneurial intentions as indicators of effectiveness (Hallam et al., 2016; Moriano et al., 2012; Valliere, 2014). By contrast, the present study employs objective knowledge assessments and topic-level learning analysis, thereby providing stronger evidence of cognitive change. In doing so, it shifts the evidentiary basis of entrepreneurship program evaluation from subjective impressions toward measurable learning outcomes.

The findings also carry important practical and policy implications. From a curriculum-development perspective, the results demonstrate the value of evaluating entrepreneurship education at the topic level rather than relying exclusively on aggregate program outcomes. Such an approach enables educators to identify high-performing and underperforming instructional components and to allocate instructional resources more strategically. From a policy perspective, the findings suggest that large-scale entrepreneurship initiatives such as Wirausaha Merdeka should be assessed not only through participation rates, satisfaction indicators, or entrepreneurial intentions but also through objective measures of learning effectiveness. The topic-level evaluation framework employed in this study provides policymakers with a practical mechanism for evidence-based curriculum refinement and continuous program improvement.

Finally, the multi-institutional scope of the cohort further strengthens the significance of the findings. Because the participants were drawn from twelve vocational higher education institutions operating within a coordinated national program, the consistency of learning gains is less plausibly attributable to local institutional conditions and more plausibly associated with the instructional architecture of the Entrepreneur Development Class itself. This strengthens the argument that the EDC model represents a potentially transferable framework for entrepreneurship education in vocational contexts. Cross-institutional differences in participant characteristics, facilitator expertise, and implementation quality may have introduced variation that aggregate analyses cannot fully capture (Natarajan et al., 2021; Roblin et al., 2018). Consequently, the observed consistency should be interpreted as strong but not definitive evidence of the robustness and transferability of the instructional model.

5. Conclusion and Suggestion

This study evaluated the effectiveness of the Entrepreneur Development Class (EDC) within Indonesia's Wirausaha Merdeka program by examining pre-test and post-test learning outcomes across ten instructional topics in a large multi-institutional cohort. The findings demonstrate that the program generated statistically significant improvements across all instructional modules, accompanied by high normalized gains and very large effect sizes, indicating substantial short-term cognitive development among participants. Topic-level analysis revealed meaningful variation in instructional effectiveness, with Business Idea

Development emerging as the strongest-performing module and Pondasi Bisnis Berkah showing comparatively lower gains despite remaining educationally effective. The findings further suggest that learning outcomes were influenced not only by instructional quality but also by participants' initial knowledge levels and the nature of the competencies being taught.

The study makes both theoretical and methodological contributions to the entrepreneurship education literature. Theoretically, it advances a topic-level perspective of entrepreneurship education effectiveness, challenging the common practice of evaluating programs solely through aggregate outcomes. By demonstrating that different instructional domains produce different patterns of learning gains, the study highlights the importance of viewing entrepreneurship education as a collection of distinct competency areas rather than as a single homogeneous intervention. Methodologically, the study illustrates the value of combining normalized gain analysis, effect-size estimation, and conventional significance testing to obtain a more accurate and diagnostic understanding of educational effectiveness. In doing so, it extends the application of learning-gain evaluation approaches within entrepreneurship education research, a field that continues to rely heavily on perception-based and intention-based indicators.

The findings also generate several practical implications for program administrators and policymakers. First, high-performing modules such as Business Idea Development, Entrepreneur Mythos, and Market and Product Research should be maintained and potentially expanded because they consistently generated strong learning gains. Second, the Pondasi Bisnis Berkah module may require pedagogical redesign through the incorporation of reflective learning activities, case-based ethical discussions, mentoring, and longer-duration experiential components to strengthen values-based learning outcomes. Third, program evaluation within Wirausaha Merdeka should move beyond participation rates and satisfaction surveys by incorporating objective topic-level learning indicators as part of routine monitoring and quality assurance processes. Finally, policymakers may consider adopting normalized gain analysis as a complementary evaluation metric for entrepreneurship programs, as it provides more equitable and actionable evidence of instructional effectiveness than raw score improvements alone. By transforming routinely collected assessment data into a systematic evaluation framework, this study offers a replicable model for evidence-based improvement of entrepreneurship education in vocational higher education settings.

6. Limitations and Future Research

These conclusions should be read in light of the study's design constraints, which also chart a path for future inquiry. Because the single-group pre-test–post-test design lacks a control group, the observed gains cannot be cleanly separated from maturation or testing effects, and the very large effect sizes should be read as upper-bound estimates of program impact, particularly given that effect sizes of this magnitude are uncommon in educational meta-analyses (Paterson et al., 2016; Sawilowsky, 2009). Moreover, the assessments captured short-term knowledge acquisition immediately after instruction, leaving open whether these gains

persist or translate into entrepreneurial behavior. The reliance on knowledge tests, while a deliberate advance over perception-based measures, also means that attitudinal and behavioral dimensions of entrepreneurial competence fall outside the present scope. Future research should therefore employ controlled or quasi-experimental designs and longitudinal follow-up to determine whether the documented gains persist and ultimately translate into entrepreneurial intention, venture creation, and business survival. Extending measurement beyond knowledge to attitudinal and behavioral competencies, and examining institutional-level variation within the consortium, would further strengthen the evidence base.

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8. Declaration of AI and AI-assisted Technologies in the Writing Process

During the preparation of this work, the author(s) used an AI-assisted language tool in order to improve the language, structure, and clarity of the manuscript. After using this tool, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

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