DESIGN OF ENTREPRENEURSHIP EDUCATION "IGNITE YOUR AMBITION" — EFFECT OF DIVERSITY INITIATIVE/DESIGN SPRINT ON MINDSET/SKILLSET

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ABSTRACT
Entrepreneurship education aims to enhance students' mindsets and skillsets, with factors, such as participant diversity and business development support, being crucial for program success. In view of the limited research on actual long-term university education programs evaluating these factors, this study assessed the impact of a Diversity Initiative and Design Sprint on Mindset and Skillset in a five-year entrepreneurship program at the University of Tokyo (2019–2023). The Diversity Initiative emphasized teaming students from different academic backgrounds, including design-oriented students from other universities and business-oriented students from different faculties, within the same institution. We developed and implemented a five-year phased entrepreneurship program at the University of Tokyo, and compared the differences across the phases. Results indicated a 42% improvement in the 'Clarity of one's own goals' factor in Mindset, although no significant effect was found for 'Ambition to move forward.' Additionally, the Design Sprint enhanced the 'Prototyping' factor in Skillset by 49%, but did significantly impact on 'Needs Verification,' possibly due to prior advancements in this area. Future program enhancements should focus on increasing participation not only from business school students, but also from corporate intrapreneurs to further develop 'Ambition.' Further research should examine mindsets across diverse student backgrounds and explore the influence of team leader attributes to provide deeper insights.

Keywords: Entrepreneurship Education, University Education, Diversity, Design Sprint

1   INTRODUCTION

In recent years, entrepreneurship education has gained global recognition. There has been a marked increase in the number of university programs aimed at enhancing students' entrepreneurial intention and business development competence, focusing on both mindset and skills [1]. Two key factors have been identified for success, i.e., 1) participant diversity and 2) methods of business development support. Arising from this, multiple universities have conducted collaborative programs to improve diversity [2]. Several approaches have been introduced for business development support [3], [4], including structured methods like the Design Sprint [5], [6]. However, there has been limited research on actual long-term university education programs, to assess the impact of 1) participant diversity on mindset and 2) business support methods on skill acquisition, allowing for a comparison of changes over time. In this study, we aim to investigate the effect of diversity and the Design Sprint on mindset and skillset of the university students.

We developed and implemented a five-year entrepreneurship program at the University of Tokyo in collaboration with Sony Group Corporation. The program was conducted in two phases: Phase 1 (including the first two years, 2019-2020) and Phase 2 (including the subsequent three years: 2021-2023). Initiatives to enhance diversity and integrate Design Sprint were introduced in Phase 2. We then compared the changes in students' mindsets and skillsets between the two phases.

2   CONCEPTS OF 'IGNITE YOUR AMBITION'

The entrepreneurship program, 'IGNITE YOUR AMBITION' (IGNT), was launched at the University of Tokyo (hereafter, UTokyo) in 2019. In 2021, the first year of Phase 2, the program was extended to

neighboring design-focused universities, the Tokyo University of the Arts (hereafter, GEIDAI) and Digital Hollywood University (DHU).

In this study, we approached the entrepreneurship program as a system, applied an axiomatic design method, and arrived at a design solution for a social collaboration course with Sony. Axiomatic design methods are used to view exercises and activities as systems that achieve specific objectives. Suh proposed a design map using an axiomatic design method [7], [8]. The design map sets the design task at the far left, breaks it down into functional requirements, combines them to derive the design components, and finally compiles them as a design solution on the far right side of the diagram.

In discussions with Sony prior to the launch of the program, its jointly established vision was defined as an entrepreneurship program where students gain clarity of one's own goals and ignite their ambition to move forward. Consequently, the same wording was adopted in the design task of the design map. The functional requirements were established as follows: 1) Mindset: Cultivating entrepreneurship, and 2) Skillset: Enhancing business development skills. Based on these, a design map was developed (Figure 1).

Figure 1. Design map of IGNT

As a key component of the designed entrepreneurship program, the Orientation Meetup was organized to promote collaboration between the students of UTokyo's SCIENCE and LIBERAL ARTS with those from GEIDAI and DHU, focusing on mindset development. In terms of skillset, the program provided Training and PBL (Project-Based Learning) opportunities to acquire Prototyping Skills, such as Expert Interviews and UX Prototyping, as well as Needs Verification Skills, including Customer Interviews and User Testing. Furthermore, two types of business development support were considered for students participating in PBL: Free Style Mentoring and the Design Sprint. An overview of the program is shown in Figure 2.
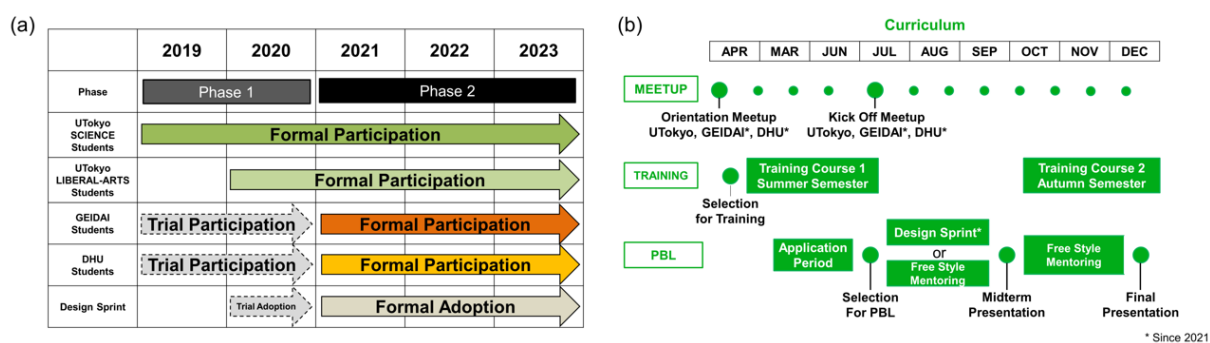

Figure 2. Overview of the IGNT, (a) timeline and (b) annual curriculum

Figure 2(a) shows that, in 2019, only UTokyo Science students were eligible for formal participation, whereas the GEIDAI and DHU students participated in trial events. By 2020, the program expanded to include all UTokyo students, and by 2021, GEIDAI and DHU students transitioned to formal participation. The Design Sprint was introduced that year.

Figure 2(b) outlines the process: In April, students attended the Orientation Meetup and networked with prospective participants. Those who passed the selection process commenced training to learn business development methods. Students who submitted business ideas and were selected joined the PBL in July, receiving funding for Prototyping and Needs Verification. At the Kick-Off Meetup, teams can add members who do not pass the PBL Selection. Teams choose between the Design Sprint and Free Style Mentoring. Midterm presentations were held in September, followed by final presentations in December, when teams showcase their business development outcomes.

3 MATERIALS AND METHODS

3.1 Diversity Initiative in Phase 1,2 and Evaluation Methods of Mindset

In 2021, the first year of Phase 2, formal collaboration was established with GEIDAI and DHU, allowing design-oriented students from both universities to participate officially. As a result, students with interests in technology, business, and design began participating in the initial Orientation Meetup; then, through a selection process, more diverse students advanced to Training and PBL in Phase 2 than in Phase 1.

To compare and evaluate the effects of the Diversity Initiative between Phases 1 and 2 on students' mindsets, both subjective and post-program behavioral evaluations were conducted on UTokyo students. For the subjective evaluation, a five-point rubric was developed based on the functional requirements of the design map, focusing on two key dimensions: 1) clarity of one's own goals and 2) ambition to move forward. The rubrics are listed in Table 1.

Table 1. Rubric for subjective evaluation of mindset

Mindset 1) Clarity of one's own goals	1. I do not have a clear direction and cannot explain it to others. 2. I have some sense of direction, but I find it difficult to explain it to others. 3. I have not organized my thoughts yet, but I can manage to explain them to others. 4. I have not found the right words, but I can mostly explain my thoughts to others. 5. I am articulate and can explain my thoughts concisely to others.
Mindset 2) Ambition to move forward	1. I do not have any inner strength and think I will not take action. 2. I do not entirely lack inner strength, but I think it is difficult to take action. 3. I do not have a clear recognition yet, but I think I can take action. 4. I am not confident that I have enough strength, but I can gradually take action despite some hesitation. 5. I believe I have enough strength and can take concrete action with clarity.

Students responded to the above survey about both when the training commenced (April) and when PBL concluded (November), and the effect was evaluated based on the differences in their scores.

For the post-program behavioral evaluations, two aspects were investigated:
Percentage of PBL teams that voluntarily continued their activities into the following year.
Percentage of PBL teams that founded a startup in the following year.

3.2 Business Development Support in Phase 1,2 and Evaluation Methods of Skillset

Among the student teams selected for PBL, those who chose Design Sprint conducted it over the designated period from July to September, during the summer vacation, while teams that did not choose the Design Sprint received Free Style Mentoring during this time. Therefore, in Phase 1, none of the students conducted the Design Sprint, and all teams engaged in Free Style Mentoring for business development. In Phase 2, the students had the option of either the Design Sprint or Free Style Mentoring. This allowed a comparison between Phases 1 and 2 to measure the effect of the Design Sprint.

The format of the Design Sprint, as implemented on the online whiteboard tool Miro provided by IGNT, is shown in figure 3.
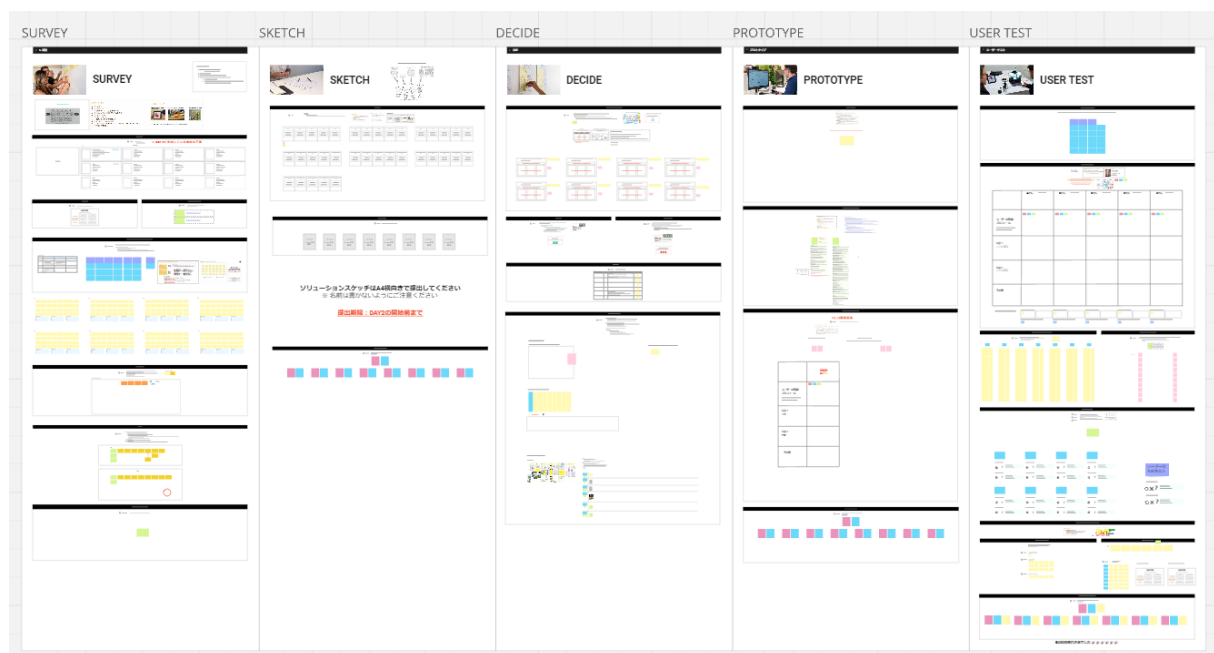

Figure 3. Format of Design Sprint

This format visualizes the process and sequence of expert interviews, prototyping, and user testing, making it easier for students to systematically understand the overall picture of business development. Moreover, since the Design Sprint involves intensive business development, from ideation to prototyping and user testing, over a short period of three to five days in the initial period of team activities, it helps teams get a strong head start.

Subjective evaluations were conducted on UTokyo students to compare and assess the effect of Design Sprint between Phases 1 and 2 on students' skillsets. Like for Mindset, a five-point rubric was developed, corresponding to the functional requirements of the design map: 1) Prototyping and 2) Needs Verification. The rubrics are listed in Table 2.

Table 2. Rubric for subjective evaluation of skillset

Skillset 1) Prototyping	1. I have little to no experience and cannot explain it to others. 2. I have some experience, but I find it difficult to explain to others. 3. I have not fully organized my thoughts yet, but I can somehow explain it to others. 4. I do not have a systematic understanding, but I can mostly explain it to others. 5. I have a systematic understanding and can explain it to others in my own way.
Skillset 2) Needs Verification	1. I have little to no experience and cannot explain it to others. 2. I have some experience, but I find it difficult to explain to others. 3. I have not fully organized my thoughts yet, but I can somehow explain it to others. 4. I do not have a systematic understanding, but I can mostly explain it to others. 5. I have a systematic understanding and can explain it to others in my own way.

Students responded to the above survey both when the training commenced (April) and when PBL concluded (November), and the effect was evaluated based on differences in their scores.

4 RESULTS

4.1 Student Participation
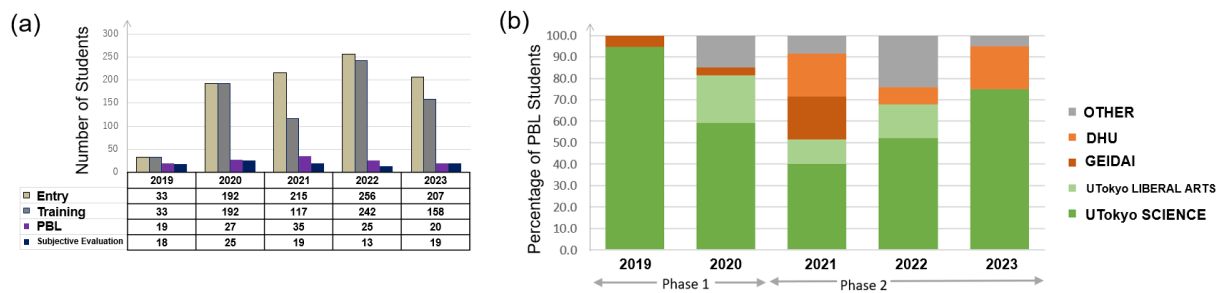The status of student participation over five years is shown in Figure 4.

Figure 4. Changes in (a) number and (b) affiliations of participating students

Figure 4(a) shows that the number of entries increased from 33 in 2019 to over 200. The number of participants in the training program also increased since 2019, with a formal selection process for enrollment introduced in 2021. The number of PBL participants remained relatively stable at approximately 25. Only students who proposed a business idea and were selected could participate in PBL. The number of respondents to the subjective evaluation of the Mindset/Skillset closely matched the number of PBL participants, suggesting that most PBL participants completed the survey.

Figure 4(b) shows that PBL participation from GEIDAI and DHU was below 5% during Phase 1. In contrast, during Phase 2, after GEIDAI and DHU participated formally, their participation increased to a range of 10-40%.

Table 3 shows the status of the PBL teams.

Table 3. Status of PBL teams

	2019	2020	2021	2022	2023
Number of PBL Teams	8	7	9	6	6
The percentage of teams composed of UTokyo with either GEIDAI or DHU	13	14	56	33	50
The percentage of teams that conducted the Design Sprint	0	14	56	33	50

Table 3 shows that the number of PBL teams remained consistent at approximately eight over the five-year period. The percentage of teams composed of UTokyo students in collaboration with either GEIDAI or DHU students was slightly below 15% during Phase 1 but increased significantly to 30-60% in Phase 2. A similar trend is observed in the percentage of teams that conducted the Design Sprint. Based on these results, in evaluating the effect of the Diversity Initiative and Design Sprint on Mindset and Skillset, it is considered valid to compare Phase 1 under nearly identical conditions and Phase 2 under similarly consistent conditions.

4.2 Mindset Evaluation

A five-point rubric for the subjective evaluation of Mindset was applied at both the commencement and conclusion of the phases, and the average scores for all students were calculated. Figure 5 shows the results of Phases 1 and 2.
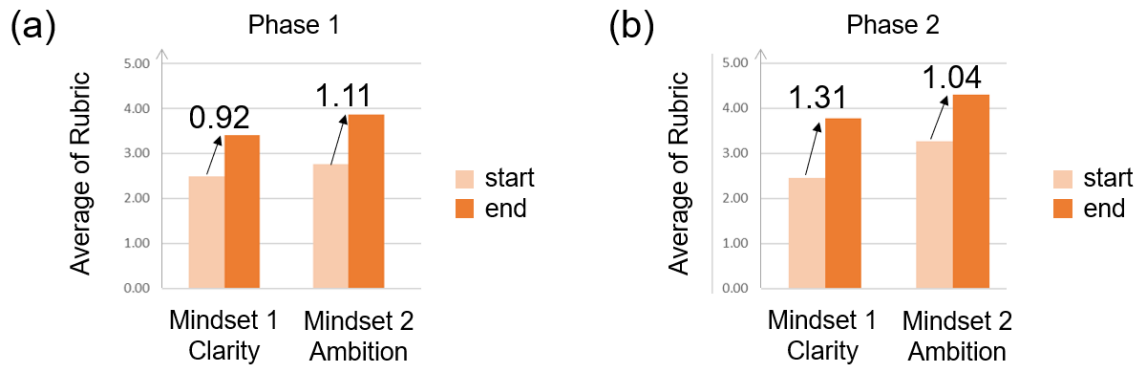
Figure 5. Results of Subjective Evaluation of Mindset of (a) Phase 1 and (b) Phase 2.

In Phase 1, Mindset 1, i.e., 'Clarity of one's own goals' increased by 0.92, and Mindset 2, i.e., 'Ambition to move forward' increased by 1.11. Similarly, in Phase 2, Mindset 1 increased by 1.31, and Mindset 2 increased by 1.04.

The results of the behavioral evaluation of Mindset are shown in Table 4 below.

Table 4. Results of Behavioral Evaluation of Mindset

	2019	2020	2021	2022	2023
Number of PBL Projects	8	7	9	6	6
Projects that continued activities into the following year	1	4	3	5	4
Projects leading to a startup in the following year	1	3	0	4	0

The number of projects that continued activities in the following year was one in 2019 but increased to approximately four from 2020 onwards. The number of projects leading to a startup in the following year has also increased since 2020 compared to 2019, but there is significant dispersion across years.

4.3 Skillset Evaluation

A five-point rubric for the subjective evaluation of the Skillset was applied at both the commencement and conclusion, and the average scores of all students were calculated. Figure 6 shows the results of Phases 1 and 2.
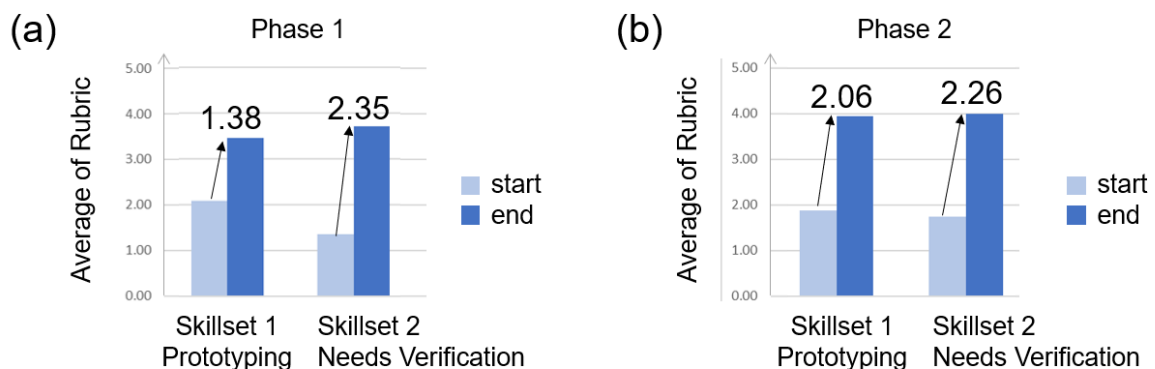

Figure 6. Results of Subjective Evaluation of Skillset of (a) Phase 1 and (b) Phase 2.

In Phase 1, Skillset 1, i.e., 'Prototyping' increased by 1.38, and Skillset 2, i.e., 'Needs Verification' increased by 2.35. Similarly, in Phase 2, Skillset 1 increased by 2.06, and Skillset 2 increased by 2.26.

5   DISCUSSION

In discussing the subjective evaluation, the increase in each rubric average is summarized in Figure 6.
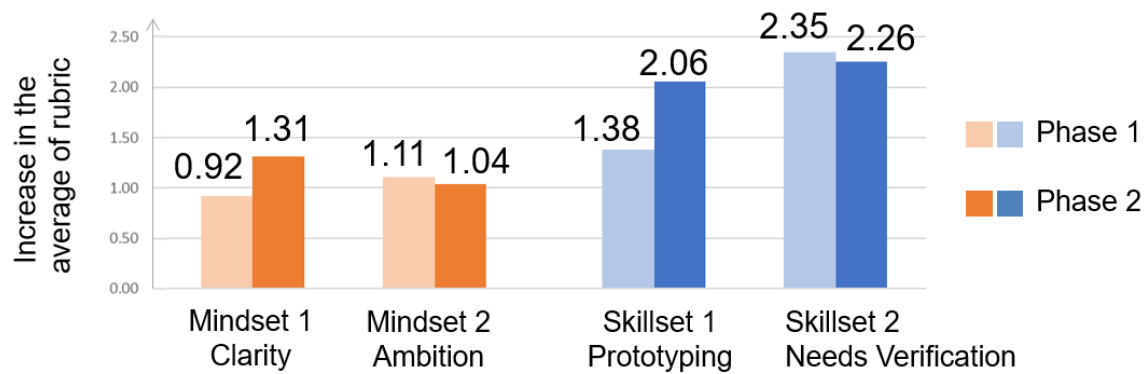
Figure 6. Results of increase in each rubric average

In Phase 1, the average rubric score for Mindset 1 increased from 2.49 at the start to 3.41 at the end, resulting in an overall increase of 0.92. Similarly, in Phase 2, the score increased by 1.31. Comparing the increase between Phases 1 and 2 allowed for the evaluation of the effect of the intervention on this aspect of the program. A similar comparison was conducted for Mindset 1, Mindset 2, Skillset 1, and Skillset 2, as shown in Figure 6.

5.1 Effect of Diversity Initiative on Mindset

The following discussion arises from the subjective evaluation in Figure 6: Mindset 1 increased by 0.92 in Phase 1 and by 1.31 in Phase 2, reflecting an approximately 42% increase, indicating that the Diversity Initiative had a positive effect. As intended, teaming up with GEIDAI/DHU students, who have a stronger desire for self-expression, likely helped UTokyo students gain clarity regarding their own goals.

Mindset 2 did not demonstrate any significant difference in increase between phases 1 and 2. Although the program contributed to an increase of more than one point on the five-point scale in ambition to move forward, the Diversity Initiative did not show a significant difference. Possible reasons include: 1) the small proportion of Liberal Arts students participating in PBL (less than 10 %) and 2) the absence of a business school in UTokyo, which may have resulted in lower-than-expected ambition levels among Liberal Arts students. Further research, including an analysis of the mindsets and ambitions of students from UTokyo, GEIDAI, DHU, and other general business schools in Tokyo, could provide deeper insights into these findings.

The following discussion can arise from the behavioral evaluation: the number of PBL teams that continued activities in the following year increased from one in 2019 to three or more from 2020 onwards, suggesting that collaboration with UTokyo's Liberal Arts students may have had a positive effect. However, the number of PBL teams that founded startups showed no correlation with the Diversity Initiative, with significant dispersion from year to year. It is likely that once someone founds a startup, it becomes a model case, encouraging others to follow suit. In such cases, involving participants with stronger entrepreneurial intentions, such as business school students or corporate intrapreneurs, may increase the number of teams that found startups. Since decisions regarding the continuation or launch of a startup tend to reflect the leader's intentions more than the team's consensus, further research focusing on the attributes and mindset of team leaders could provide deeper insights.

5.2 Effect of Design Sprint on Skillset

The following discussion can arise from the subjective evaluation in Figure 6: Skillset 1 increased by 1.38 in Phase 1 and by 2.06 in Phase 2, reflecting an increase of approximately 49%, indicating that the Design Sprint had a positive effect. As intended, Design Sprint, which involved expert interviews and prototyping within a short period, possibly helped UTokyo students gain prototyping skills.

Skillset 2 showed no significant difference in increase between phases 1 and 2. Although the program contributed to an increase of more than 2.2 points on the five-point scale in Needs Verification, Design

Sprint did not demonstrate a significant difference. Possible reasons include that an increase of more than 2.2 points on a five-point scale is already a substantial improvement, and even without Design Sprint, the basic training and PBL with Freestyle Mentoring may already have had a significant effect, leading to no additional noticeable difference. Feedback from UTokyo students, regardless of their background in science or liberal arts, frequently highlighted the value of learning not only 'how to make' and 'how to ideate,' but also 'how to verify the needs' from the early stages of conceptualization to refine their ideas and prototypes.

6   CONCLUSIONS

In this study, an entrepreneurship program in UTokyo was designed to enhance both mindset and skills. A five-year comparative evaluation from 2019 to 2023 assessed the effect of the Diversity Initiative/Design Sprint on Mindset/Skillset. The Diversity Initiative improved the 'Clarity of one's own goals' factors in Mindset by approximately 42%, but no significant difference was found for the 'Ambition to move forward.' This may be due to the positive effect of teaming with design-oriented GEIDAI/DHU students, who have a strong desire for self-expression, whereas the participation ratio or ambition level of business-oriented UTokyo Liberal Arts students was lower than expected.

Design Sprint increased the Prototyping factor in Skillset by approximately 49%. This improvement can be attributed to the positive effects of conducting expert interviews and prototyping over a short period within the Design Sprint. However, the Design Sprint had no significant effect on 'Needs Verification,' possibly because this factor had already improved by over 2.2 points on a five-point scale, indicating strong results from the existing curriculum.

Future improvements in program design should focus on increasing the participation of business school students or corporate intrapreneurs to further enhance ambition. Concurrently, deeper research should include detailed analyses of student mindsets across different backgrounds and behavioral evaluations focused on team leader attributes to provide greater insights.

ACKNOWLEDGMENTS

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