CULTIVATING STRATEGIC MINDSET THROUGH A CO-DESIGN PROJECT

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ABSTRACT: This paper discussed how to use co-design approach to cultivate a strategic mindset of designers, which includes analytical thinking, problem-solving, communication skills, and management skills. With these capabilities, designers can respond to the increasing complexity of business and solve complex problems. However, design education has traditionally emphasized the cultivation of skills and a single problem-solving approach. In the co-design process, designers need to conduct multi-dimensional communication and coordinate with stakeholders to co-create solutions. This requires a higher level of strategic thinking and a holistic view. Integrating co-design into design education can be challenging, including coordinating multiple stakeholders, clearly assigning tasks, and leveraging their strengths. To illustrate this, the paper presents a co-design project —a new product development and strategic plan. The project involved multiple parties, such as professors, business owners, and industry mentors. The project was divided into several phases, research, ideation, prototype, and product launch. Integrating co-design into design education nurtures students' strategic mindset and enhances their innovative thinking. Co-design expands students' problem-solving capabilities, improves their communication skills, and enables them to work effectively in interdisciplinary teams. Therefore, this paper suggests that design educators should integrate co-design to better equip students for the intricate and dynamic business environment.

Keywords: Co-design, Strategic Mindset, Stakeholder, Problem-Solving, interdisciplinary Collaboration

1. INTRODUCTION

Strategic mindset (thinking) refers to the thinking process in which individuals or groups plan on major issues that are global, long-term, and fundamental to the relationship. The strategic mindset involves the ability to analyze, synthesize, evaluate, anticipate, and make decisions. O'Shannassy (2003) defined strategic thinking as combining creativity and analysis; Bonn (2005) believed that the core elements of strategic thinking are system thinking, creativity, and foresight; Nichols (2016) suggested that although the vision may be future-focused and broad, strategic thinking should include short-term and clear outcomes. Today's complex and dynamic systems demand designers to have certain strategic thinking ability. Usually, strategic mindset (thinking) ability refers to the ability to analyze, synthesize, judge, foresee, and make decisions on major issues that affect the overall, long-term, and fundamental situation. Especially the interdisciplinary work plays a crucial role in supporting the strategic mindset. Therefore, educational institutions must pivot to focus on interdisciplinary and collaborative pedagogy,

integrating strategic mindset and design thinking, to meet the growing demands for complexity in business.

Today's designers are facing more complex and dynamic systems and trans disciplinary issues than independent events or isolated topics (Feil, 2013). Companies seek design strategies to remain competitive. With the evolution in design, the shift from a user-centered approach to co-design is changing the roles of the designers (Sanders & Staplers 2008). Those changes turn designers from translators into facilitators and co-create new systems, services, and even policies (Sanders & Staplers 2008). These changes also urge design practitioners to combine strategic mindset and design thinking (Herrmann & Gold-schmidt, 2013). More recently, Laptev et al discussed the theory that co-design can enhance innovative thinking in entrepreneurial education by helping students develop leadership skills throughout the creative process of concept generation and innovative solution development (Laptev & Shaytan, 2022). Co-design is increasingly popular in many businesses and organizations and has been successfully applied to businesses and organizations, such as IKEA, HelloFresh, and Dewalt. Compared with traditional consumer design discipline, in newer design discipline practices, co-design has played an important role such as interaction design, service design (Steen, Manschot & Koning, 2011), and healthcare design (Noorbergen, Adam, &Roxburgh, 2021; Donetto, & Donetto, Pierri; 2015, Morshedzadeh, 2022). Several ranges of benefits for users and organizations have been discussed in both commercial and nonprofit (Steen, Manschot & Koning, 2011). However, integrating co-design into design education will encounter difficulties such as many varieties of cross-discipline language barriers (Sanders & Staplers, 2008). Design education needs to provide learning experiences and reframes curricula incorporating co-design. Park and Lee (2021) suggested that encouragement in various interdisciplinary experiences would help students gain strategic experience. They also pointed out that additional practical, multicultural, and interdisciplinary applications of strategic thinking are needed to bridge the gap between theoretical and practical classes (Park & Lee, 2021). Design education traditionally has emphasized the cultivation of design skills and a single problem-solving approach. In the co-design process, designers need to conduct multi-dimensional communication and coordinate with other stakeholders to co-create solutions. This requires a higher level of strategic thinking and a holistic view. Integrating and implementing co-design into design courses can be challenging, including coordinating multiple stakeholders, clearly assigning tasks, and leveraging their respective strengths.

This paper proposes a case study of cultivating students' strategic thinking ability by completing a new product development project composed of an interdisciplinary team, based on investigating the status of students' strategic thinking. This case study involves multiple parties, such as professors, business owners, industry mentors, and other relevant stakeholders. The project is divided into several stages: identifying opportunities and research, ideation, prototype testing, and product launch. The practice has shown that co-design has expanded their problem-solving abilities, improved their analytical thinking and communication skills, and enabled them to manage the project and work effectively in interdisciplinary teams.

2. CO-DESIGN COURSE PROJECT

2.1 PARTICIPTAED STUDENTS IN CO-DESIGN COURSE
This project is a one-semester course participated by students from the design and business disciplines. The topic is Innovation in Product Development. Total number of students is 30 with 13 design students (43%) and 17 business students (57%). There are over 70% of seniors participated in this class.

In order to understand participants' expertise area and related strategic skillset to better integrate into the course content, the researchers used pre course (pre survey) and post course survey (post survey) method (the survey was reviewed and approved by the Institutional Review Board at East Stroudsburg University of Pennsylvania, IRB protocol number: #ESU-IRB-059-2223). From the pre survey, more than 70% of students admitted that strategic mindset (thinking) is very important for their career development. Also, we asked each student to self-rate their related skills (see Table 1) which are analytical thinking, problem-solving, communication and management skills included in strategic mindset (1 is poor and 10 excellent), and we received 29 responses. The pre survey result indicated that most participants were very satisfied with their communication skills (M=7.82). However, 40% of students rated their analytical thinking and problem-solving from 4-7. And 50% of students rated their management skills from 4-7.

Strategic Skills	Analytical Thinking	Problem-Solving	Communication Skills	Management Skills
Description	abilities to identify and define a problem; extract key information from the data related its solutions	act of defining a problem; identifying, prioritizing, and selecting alternatives for a solution; and implementing a solution.	ability to communicate clearly and effectively both verbally and visually	encompasses the ability of business planning, decision-making, problem-solving, communication, delegation, and time management

Table 1. Questionnaires used in Pre and Post Survey

2.2 COURSE OBJECTIVES AND ASSESSMENT

With the pre survey results at hand, the team had a solid foundation to develop a systematic course content for the class, especially focusing on analytical thinking, problem solving, and improving students' management skills. A new course content was designed to include lectures, group meetings, workshops, and external stakeholder participation to facilitate the co-design process and help enhance students' strategic mindsets. The students worked in groups comprising different disciplines to develop a new product and to create a strategic plan. The project was divided into several phases: identifying opportunities and research, ideation, prototype testing, and product launch and each phase involves both internal stakeholders and external stakeholders. For example, professors, business owners, users, industry mentors, and students were all involved in the ideation and prototype phases. Professors provided guidance and facilitated the coordination of all activities. Business owners and users contributed research insights and actively participated in co-design workshops. Industry mentors offered valuable resources and feedback. The student teams successfully engaged in effective communication with all these stakeholders, ensuring a multi-faceted exchange of ideas and insights.
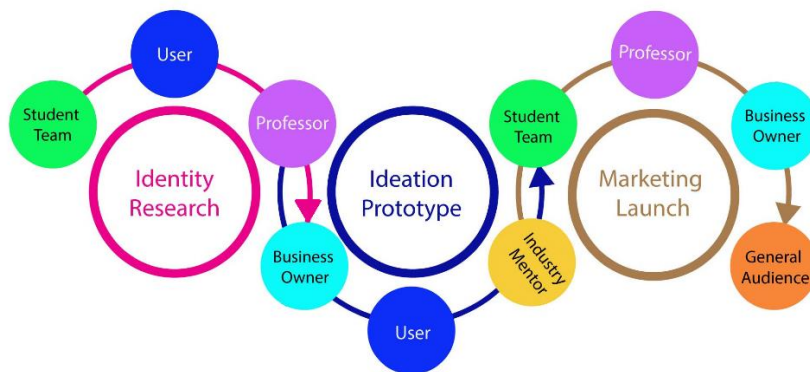

Figure 1. Stakeholder participation map in each phase of the co-design project

In order to provide foundation support for the project, this class also covered various topics that encouraged them to incorporate different perspectives:

- Design Perspective: Design thinking, Co-design approach, Problem-solving
- Psychology Perspective: User research, User Profile, User Journey Map, Conduct User Survey Consumer behavior characteristics
- Entrepreneur Perspectives: Entrepreneurial mindset, Business and strategic plans, Distribution channels, Financial analysis, Sales and marketing tactics, Product development and viability
- Business and Management Perspectives: Marketing research, Project management, leadership, Team management, Competitive analysis

Table 2 listed the students' tasks, learning outcomes and skill assessments in each project phases. In each phase, faculties and external stakeholders evaluated students' learning outcomes and skill improvements based on the performance of breakdown tasks, which involve regular check-ins, progress reports, metrics. Also, their skill improvement can be reflected from the self-rated post survey.

Phase	Breakdown Task	Learning Outcome	Skill Assessment
Phase1 **Identify Opportunity Research**	Pitch ideas and form groups Gantt Chart and Research Plan Marketing Research	Reinforce systematic user-research methods Project Gantt Chart Research Presentation The ability to work effectively internal and external	Communication Skills Problem Finding Planning Skills Analytical Thinking Research Skills
Phase 2 **Ideation**	Co-design workshop User Journey Map Individual Concept Sketch Digital Cad Model	Collaboration with external stakeholders Communicate concepts and specifications in verbal, written, and multiple media	Problem-Solving Visual Communication Analytical Thinking
Phase3 **Prototype & Test**	Budget Plan for Prototype Prototype Test Plan Prototype	Effective Decision Making Design Thinking	Technical Skills Self-learning Skills
Phase 4 **Marketing Campaign**	Business Plan Competitor Analysis Demographic & psychographic research Product Pricing Sales and Marketing Channels	Basic business practices and their relationship to design and creative field Ethics and Social Responsibility Gain the skills and mindsets of how to start a business	Leadership Skills Management Skills Communication Skills Empathy Capacity Influence others

Table 2. Breakdown Tasks, Students' Learning Outcomes, and Skill Assessments involved in each project phase

2.3 CO-DESIGN PROJECT IMPLEMENTATION

The project started with identifying opportunities and pitching ideas to the whole class. Students were challenged to seek inspiration and explored their areas of interest, and through two rounds of pitch classes, six ideas were selected out of twelve, and teams of students were formed. The selected ideas included tangible products like trolleys for ladders, fish bait, and wasteless bottles, as well as apps such as a home deco app and a virtual avatar-fashion app. The students collaborated to develop a semester Gantt chart and research plans. Since this is an interdisciplinary group project, the faculty employed various strategies to address the issue of unequal effort, which is a common challenge in group dynamics. Firstly, both faculties clearly defined the roles and responsibilities of each group member in each phase. Each group consisted of a manager, content editor, treasurer, and several designers. Secondly, each team presented their Gantt chart, which aided in time management and outlined the responsibilities of each member. Research was also an essential component as it yielded crucial business data, including product viability, defining the target market, user profiles, and competitive analysis.

The research integrated perspectives from business helped to shift the design students' focus from a product function/feature level to the business strategic level, through examining the related market and identifying gaps in the existing market. In the user research, co-design encourages empathy, more interaction with users, and a deep understanding of user perspectives. Through exposed to different viewpoints, challenges, and aspirations, it helps in developing strategic mindsets and fosters empathy-driven decision-makings. Understanding user needs in-depth also opens up possibilities for innovative solutions. Business owners involved in the ideation phase not only hearing the students presented their research findings and conducted several quick co-creation workshops by using accessible materials such as sticky notes, paper clips, foam, clay (see Figure 2) to involve business owners in initially co-designing concepts for the ideation phase. A number of conversations with users and business owners helped change the students' initial implicit assumptions.

Figure 2. Discussions with Business Owners and Co-design Workshop of Building Fish Bait Prototype

The design students mainly completed the ideation and prototype testing phases. Compared with the user-centered design process, students were able to conduct multi-dimensional communication with stakeholders such as potential users and industry mentors to co-create solutions. Guidance from the design professor and industrial mentors helped break down larger and systematic tasks into smaller, more manageable tasks, and provide more guidance to help students stay on track. Students' concepts were reviewed by industrial mentors for two rounds virtually. It is no doubt that the difficulties they encountered, such as disciplinary language barriers and wide topics, highlighted the importance of considering these factors in discussion session.

In the final phase of the project, the focus is on preparing for the product launch. To enhance communication and overcome disciplinary barriers, the professors assisted in breaking down tasks and providing guidance. This involved promoting plain language, encouraging active listening, and utilizing visual aids. The design students presented their final design and prototype to the business students, who then adjusted and developed a business and marketing plan. This plan included elements such as a customer journey map, sales channel, competitive analysis, and extensive market research to align with the product's functions and features. Considering that the business students were less familiar with art-based product design, the design students were encouraged to utilize visual languages like 3D CAD animation, exploded views, and 3D printed prototypes to explain the overall design. Through discussions with stakeholders, including industrial mentors and business owners, the students refined their sales forecasting and financial analysis in preparation for the launch. Furthermore, students were provided with extracurricular activities, resources, and opportunities to showcase their product in future business competitions.

2.4 PROJECT OUTCOMES AND REFLECTIONS
Several teams in the co-design class were able to develop successful breakthrough solutions. Three senior student teams showcased their research and final designs at the University Undergraduate

Research Symposium, these presentations garnered positive feedback from professors and the art education community. Furthermore, selected project outputs were submitted to business competitions and entrepreneurial ventures. Notably, three projects (Fish Bait, Wasteless Bottle, and HomeDeco App) participated in the 2022-23 Passhe State System Startup Challenge, with Fish Bait reaching the final pitch and securing the 1st Prize from prominent investors. Co-design projects have the potential to push boundaries, challenge assumptions, and unlock new possibilities.
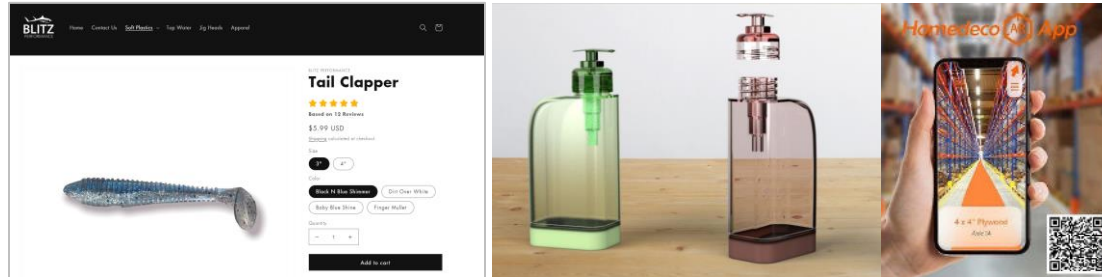

Figure 3. Fish Bait Launch Website, Wasteless Bottle, and HomeDeco App Prototype

The interdisciplinary co-design learning experience offered an enjoyable opportunity for students to explore their own ideas while gaining insights into the business side of independent creation. Feedback received from students highlighted that "experience was very eye opening", "this project helped me to recognize the process of making/developing a product", "meetings with stakeholders and other mentors gave me valuable experience", "work with people with a completely different mindset than an entrepreneur was great", and "beneficial to have the feedback by the professional business and marketing visitors". The above reflected the importance of integrating co-design in teamwork and collaboration, and the value of interactions with stakeholders and mentors.

2.5 ANALYSIS OF PRE AND POST COURSE SURVEY RESULTS

To evaluate the enhancement of students' strategic mindset upon completing the course, we requested each student to self-rated their related skills on a scale of 1 to 10, with 1 representing poor and 10 representing excellent. We obtained 26 responses and compared them to the pre-survey results. The paired t-test was employed to analyze the improvement in strategic abilities, with an alpha level set at .05. The comparison, depicted in Figure 4, revealed that analytical thinking ($p=.006$**) and management skills ($p=.012$*) demonstrated significant improvement, surpassing that of problem-solving ($p=0.058$) and communication skills ($p=.144$). This disparity arises from the lack of emphasis on training students' analytical thinking and management skills in traditional design studios. Conversely, students appeared to possess greater confidence in their problem-solving and communication skills, likely due to previous courses that focused more on these abilities, as both design and business students were trained extensively in those areas. In summary, the overall improvement in strategic mindset, encompassing all four abilities, was highly significant (increasing from 6.76 to 8.85, $p<.001$**).

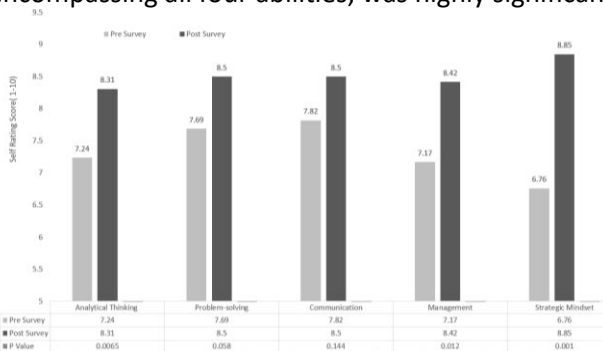|	Analytical Thinking	Problem-solving	Communication	Management	Strategic Mindset
Pre Survey	7.24	7.69	7.82	7.17	6.76
Post Survey	8.31	8.5	8.5	8.42	8.85
P Value	0.0065	0.058	0.144	0.012	0.001

Figure 4. Comparison of Paired Samples T-test Statistics for Pre and Post Survey (N=29 in Pre Survey, and N=26 in Post Survey)

3. DISCUSSION AND CONCLUSION

3.1 OVERCOMING DISCIPLINE BARRIERS IS THE KEY TO SUCCESS IN CO-DESIGN

Based on the survey results, students exhibit a high level of confidence in their individual communication skills (M=7.82, SD=1.89). Nevertheless, certain communication barriers continue to emerge, impeding their overall progress. In order to help address discipline barriers, some guidance such as background information, emphatic capacity, and active learning needed to be provided in time. That guidance would help stakeholders from different disciplines and from different backgrounds to overcome the discipline barrier and communicate more effectively. During the class, we also encouraged team members to communicate openly and ask questions within the team also to the externals. In addition, students reflected group work outside the class allowed them to communicate enough to work toward a common mission.

3.2 CO-DESIGN PROVIDES A COLLABORATIVE AND INCLUSIVE ENVIRONMENT

The interdisciplinary co-design project prepared students to engage in their own agency, working with stakeholders from different disciplines and backgrounds to help set the stage for lifelong learning and application of the principles of diversity, equity, and inclusion. It is necessary to all three aspects to ensure meaningful and lasting progress to which students, professors, and other stakeholders are embraced, supported, and enabled to make meaningful contributions.

3.3 CO-DESIGN REINFORCES THE HOLISTIC MANAGEMENT CAPABILITY

The management skill was largely improved in the co-design project. The co-design approach allows researchers and designers to interact with other external stakeholders and coordinate within team members and resources. This will shift the designer's and researcher's role from the translator into a facilitator and better help guide the project into a validation product trajectory. The shift of the role will help students from both design and business disciplines improve their holistic perspective and management skill. In the co-design project, as the time management tool, Gantt chart helped individuals learn their strengths and weakness and helped to manage a long-term project effectively. Other than that, by breaking down the project into smaller, manageable tasks and assigning them to team members with specific deadlines, the Gantt chart helped ensure effective management and successful project outcomes, thus improving students' management capability and we will carry to the future work.

3.4 OPEN THEMES OR RESTRICTED THEMES

A challenge faced during the co-design course development process was the decision to assign a specific theme to all teams or to allow students to develop their individual interests through open themes. The choice to allow students creative freedom was selected to foster individuality and inclusion projects varied widely, from home goods, industrial equipment, to fashion apps. Obstacles were faced regarding access to mentors and stakeholders with specific knowledge in the project sectors. Thus, the ability of students to receive substantive feedback to assist with their projects was limited. One of the students mentioned that "*Too much freedom in product design projects can often lead to chaos and confusion, as students may struggle to identify a clear focus or direction for their work*". Considering those concerns, having restricted themes can provide a shared context for the entire class to work within, and also increase inter-team interactions during the class. Based upon the complexity of contextualization, careful analysis of project selection and theme will be undertaken in future co-design course development.

3.5 CONDUCT INTERVEIW IN THE FUTURE

By comparing the two surveys, researchers were able to evaluate the performance of students' strategic mindset skills in co-design projects. The results demonstrated a significant enhancement in students' overall strategic mindset, as well as improvements in analytical thinking and problem-solving abilities. In future studies, interviews will be utilized as a robust method to gather additional insights. These interviews will involve not only the students but also stakeholders such as industry mentors and business owners who actively participated in the co-design projects. Through a series of interviews, valuable insights will be obtained regarding the improvement of strategic mindset in co-design projects and the significance of further developing interdisciplinary co-design curricula.

In summary, to explore a more effective co-design approach and recognize the improvement of the strategic mindset and related skills in design education, different types of co-design in various stages and examining of strategic assessment have been collected for exposing and analyzing the student's performance in the above case study. It was found that no matter what type of co-design method is and what phase is, students are likely to be more strategic, involved, and inspired through the co-design process in an interdisciplinary context. The integration of co-design in design education not only cultivates students' strategic mindset but also enhances their innovative thinking. Co-design expands their analytical thinking and management capabilities, improves their problem-solving and communication skills, and enables them to work effectively in interdisciplinary teams. Therefore, this paper suggests that design educators should integrate some level of co-design into their curricula to better prepare students for the complex and dynamic business environment.

4. REFERENCES

Bonn, I. (2005). Improving strategic thinking: A multilevel approach. Leadership and Organization Development Journal, 26 (5), 336-354.

Donetto, S., Pierri, P., Tsianakas, V., & Robert, G. (2015). Experience-based co-design and healthcare improvement: realizing participatory design in the public sector. The Design Journal, 18(2), 227-248.

Feil, M. (2013). Reinventing Classic Design Foundation Exercises to Incorporate the Exploration of Behavior and Interaction. Paper. Austin, TX: Industrial Designers Society of America Education Symposium, Aug. 18, 2014.

Herrmann, M., & Goldschmidt, G. (2013). Thinking about design thinking: a comparative study of design and business texts. In ICoRD'13: Global Product Development (pp. 29-40). Springer India. https://doi.org/10.1007/978-81-322-1050-4_3

Laptev, G. and Shaytan, D. (2022). Co-design-based learning for entrepreneurs in the digital age. Measuring Business Excellence, Vol. 26 No. 1, pp. 93-105. https://doi.org/10.1108/MBE-11-2020-0158

Morshedzadeh, E. (2022). Community-Centered Participatory Research In Healthcare Design Education. https://www.idsa.org/wp-content/uploads/Community%20Centered%20Participatory%20Research%20In%20Healthcare%20Design%20Education.pdf

Nickols, F. (2016). Strategy, strategic management, strategic planning and strategic thinking. Management Journal, Vol. 1, No. 1, pp.4–7.

Noorbergen, T. J., Adam, M. T., Roxburgh, M., & Teubner, T. (2021). Co-design in mHealth systems development: insights from a systematic literature review. AIS Transactions on Human-Computer Interaction, 13(2), 175-205.

O'Shannassy, T. (2003). Modern strategic management: Balancing strategic thinking and strategic planning for internal and external stakeholders. Singapore Management Review, 25 (1), 53-67.

Park, W., & Lee, H.-K. (2021). Creative integration of design thinking and strategic thinking in a design education framework. Creativity Studies, 14(1), 160-174. https://doi.org/10.3846/cs.2021.13700

Sanders, E.B. N., & Stappers, P.J. (2008). Co-creation and the new landscapes of design. Co-design, 4(1), 5-18.

Steen, M., Manschot, M., & De Koning, N. (2011). Benefits of co-design in service design projects. International Journal of Design, 5(2).