International Journal of Research Studies in Education
2024 Volume 13 Number 19, 1-15

Discursive knowledge, capacity, and practices among product design majors in Chinese universities

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Received: 25 October 2024 **Revised**: 22 November 2024 **Accepted**: 10 December 2024
Available Online: 10 December 2024 **DOI**: 10.5861/ijrse.2024.24763

ISSN: 2243-7703
Online ISSN: 2243-7711

OPEN ACCESS

Abstract

This study examines the discursive practices, knowledge, and capacity of Chinese university students majoring in product design. It focuses on how these components affect students' design processes as well as their potential for productive communication and teamwork in design environments. Design thinking and innovation are being shaped by discursive activities like conceptualization, collaboration, prototyping, and presentation, which are becoming more and more important as design education changes to meet the demands of a more globalized and interdisciplinary industry. Surveys and interviews with students from various Chinese universities that provide product design degrees were conducted for this study. The association between students' discursive skills and their success in important design tasks, such as design critique, presentations, group projects, and internships, was assessed using statistical analysis. Strong discursive knowledge and good design outcomes are significantly correlated, according to the data, suggesting that students with higher discursive capacities typically do better on both theoretical conceptualization and practical design tasks. The study also emphasizes how critical it is to incorporate discursive practices into the curriculum for product design, stressing the need of industrial partnerships, interdisciplinary cooperation, and opportunities for reflective learning to develop students' skills in real-world situations. In order to help China's dynamic product design landscape, produce more holistic and communicative designers, the research concludes with recommendations for improving discursive abilities in design education. The results of this study offer educators, curriculum designers, and policymakers important new perspectives on how to help China's upcoming generation of product designers succeed in the global design business by enhancing their discursive competences.

Keywords: discursive practice, product design, Chinese universities, design education, collaboration, design thinking, innovation, curriculum development, reflective learning, industrial collaboration

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1. Introduction

In the setting of Chinese universities, the field of product design education has experienced substantial developments in recent years. Discursive knowledge and competencies have been the focus of much attention, influencing educational practices meant to prepare students for success in the globalized design industry. A thorough understanding of the subject is becoming more and more dependent on discursive knowledge, which includes the capacity to have meaningful conversations on design principles. Moreover, a key component of product design education continues to be design practice skills—the capacity to use information in an efficient manner in the real world.

Discursive knowledge refers to a student's ability to comprehend and apply design language, explain design ideas, and interact critically with other people's work in product design. In addition to being familiar with design jargon, this type of expertise requires a comprehension of the theoretical frameworks supporting design techniques and the ability to articulate them clearly. Discursive practices, which enable students to participate in critical conversations that promote deeper understanding, are essential to the formation of knowledge in educational environments, according to Fairclough (2021). As part of larger educational changes targeted at improving critical thinking and communication skills, product design courses in Chinese universities are increasingly incorporating the emphasis on discursive knowledge (Chen et al., 2022).

Product designers need to be able to put their theoretical knowledge to use in real-world scenarios. This involves the ability to create and find solutions to challenging design challenges in addition to having technical skill with design tools and techniques. According to Johnson et al. (2020), the development of competence comes from a blend of theoretical instruction and practical experience, which work together to help students assimilate and apply their information. The importance of striking a balance between imparting technical knowledge and giving students the chance to work on real-world design projects that increase their competency is becoming increasingly apparent at Chinese universities (Bin et al., 2020). This shift is essential in preparing students for the challenges of the design industry, where the capacity to translate knowledge into innovative products is highly valued. The development of well-rounded designers who can successfully navigate the intricacies of the contemporary design landscape depends on the integration of discursive knowledge and competence in product design education. According to Hyland (2022), a successful combination of these components produces students who are more capable and engaged, more equipped to contribute to the field. This integration is being pushed in Chinese universities through industrial collaborations, project-based learning, and multidisciplinary curricular reforms. By giving students the chance to use their discursive knowledge in real-world situations, these methods improve their general competency (Hyland, 2022). Even with the advancements, there are still obstacles in the way of achieving the full potential of incorporating discursive competence and knowledge into Chinese product design education. The conventional focus on technical instruction and memorization poses a number of challenges, one of which is that it may restrict students' abilities to participate in discursive activities. But as educational establishments keep changing and adjusting to the demands of the international design industry, there's growing hope that these obstacles can be surmounted.

This study aims to explore how to effectively integrate linguistic knowledge and design practice skills in China's product design education to cope with the higher demands placed on design talents by globalisation and technological development. By analysing students' feedback on the existing education model at different education stages, the study reveals the problems in current teaching and proposes optimisation solutions. The significance of the study is to provide theoretical basis and practical guidance for the innovative reform of product design education, to help educators cultivate comprehensive design talents with critical thinking,

interdisciplinary cooperation ability and practical ability, to promote China's design education system to meet international standards, and to improve the overall level of the design industry.

Objectives of the Study - This paper focused on development of discursive knowledge capacity and practices among, product design majors in Chinese universities Specifically, it determined the extent of discursive practices in terms of courses, programs, internship, Co-op activities and analytical skills, assessed the discursive capacity of students in terms of design criticize, presentation, audience content and design; identified the discursive practices in terms of conceptualization, prototyping collaboration; tested the significant relationship, between variables, and proposed a development program based on the result of the study.

2. Methods

Research Design - This study's research design was descriptive. The purpose of this design was to look into how Chinese product design students' discursive knowledge, capacity, and practice relate to one another. In order to measure the pertinent variables, the research design comprised the gathering of numerical data using surveys and questionnaires. In order to analyze and contrast various respondent groups according to their attributes—such as gender, grade level, and educational background—the study employed a comparative methodology. Research questions 1, 2, 3, and 4—which dealt with variations in the evaluation of discursive knowledge, capacity, and practices in the field of product design based on the profiles of the respondents. Furthermore, a correlation methodology was employed in the study to examine the connection between students' discursive practices and capacity and product design knowledge.

Participants of the Study - The participants in this study were Chinese product design students. The researchers used Raosoft to determine the sample size with a confidence interval of 95 per cent and a margin of error of 5 per cent. The sample size calculated was 430 students from the total population of 10 universities was 2000 participants. These participants ranged from freshmen to seniors. Since the data collection was done through an online spreadsheet, the researcher has been continuously monitoring the responses until the required number of responses was reached. After the required number of responses was reached, the researcher locked the online form and disabled new responses.

Instrument of the Study - A survey questionnaire that was tailored to the goals of the study and adapted from well-established instruments in related domains was used to collect data for this investigation. The three primary components of the questionnaire were designed to reflect the various facets of discursive knowledge, practices, and capacities among Chinese university students majoring in product design. The Assessment of Discursive Knowledge questionnaire, which was modified from Zhang et al. (2020), was the first instrument used. The thirty items in this tool evaluate students' comprehension of discursive information in connection to product design education. Topics including conceptual comprehension, the application of design theory, and the capacity to evaluate and assess design projects were all included in the items. A five-point Likert scale—strongly agree, agree, neutral, disagree, and strongly disagree—was used to record the replies. The tool was modified with the intention of capturing the unique environment of product design education in Chinese institutions. The update focused on the ways in which students understand and apply discursive knowledge in their design processes.

The Assessment of Discursive Capacity questionnaire, which was first created by Wang et al. (2021) to gauge reasoning and communication skills, was the second tool utilized. The assessment instrument, including of 25 items, appraises students' capacity to express creative concepts, participate in constructive criticism, and effectively convey their ideas in both academic and professional contexts. The questionnaire assessed five important subdomains: persuasion, critical thinking, argument creation, and feedback interpretation. The Likert scale went from highly agree to strongly disagree. The assessment of discursive practices questionnaire, which was adapted from Liu et al. (2022) study on communication practices in design school, was used in the third phase of the survey. 35 items total from six subdomains comprise this instrument: professional discursive,

cross-disciplinary communication, collaborative problem solving, engagement in studio critique, presentation skills, and reflection and feedback adaption. This tool's Likert scale went from strongly agree to strongly disagree as well. This tool was specifically modified to concentrate on the useful uses of discursive in the design process. It looks at how students put their discursive abilities to use in authentic design situations, in classroom contexts as well as during internships or group projects.

A pilot study involving 50 product design students was conducted on the instruments to verify the validity and reliability of the modified questionnaires. The questions' clarity and the suitability of the response scales were evaluated by an analysis of the responses. To further improve the tools, modifications were made in light of the pilot's outcomes. Using Cronbach's alpha, the reliability of each questionnaire part was assessed. All sections had satisfactory reliability scores ($\alpha > 0.70$), indicating strong internal consistency.

Table A

Cronbach's Alpha Reliability Test Result

Indicators	Cronbach Alpha	Remarks
Courses	0.889	Good
Programs	0.906	Excellent
Co-op Activities	0.854	Good
Analytical Skills	0.827	Good
Design Critique	0.932	Excellent
Presentation	0.910	Excellent
Discussion	0.932	Excellent
Design Thinking	0.916	Excellent
Conceptualization	0.918	Excellent
Prototyping	0.885	Good
Collaboration	0.925	Excellent
Presentation	0.954	Excellent

George and Mallery (2003) provide the following rules of thumb:"_ > .9 – Excellent, _ > .8 – Good, _ > .7 – Acceptable, _ > .6 – Questionable, _ > .5 – Poor, and_ < .5 – Unacceptable"

Data Gathering Procedure - The management of the chosen organizations and the appropriate authorities will be consulted in order to get the necessary licenses and authorizations before this study can commence with its extensive data gathering method. During the entire research process, this stage guarantees adherence to institutional policies and regulations. Participants will be identified in conjunction with school authorities upon approvals being obtained. Before the researcher administers the questionnaire, a consent form will be given to each participant. The goal of the study, the extent of their engagement, the anticipated length of their involvement, and the guarantees of confidentiality and anonymity will all be elucidated in this form. Distribution of the questionnaires will only occur following receipt of signed consent. There will be a deadline for participants to finish the questionnaires, and they will receive reminders as that time draws near. Participants will be made aware that their participation is completely voluntary and that they can leave at any time without incurring any penalties in order to promote an open and relaxed environment. The data will be meticulously arranged and ready for examination after it is collected. Depending on the severity of the problem, participants may be excluded or asked for clarification if questionnaires are incomplete or incorrectly completed. The analysis phase, which aims to provide a thorough understanding of the inter-organizational business network and its influence on operational efficiency, will start after all data has been verified.

Data Analysis - To address the research questions, a thorough statistical analysis will be performed on the data gathered via the questionnaire for this study. The following statistical methods and instruments will be employed in the analyses: For every survey item, means and standard deviations will be computed; the mean will indicate the typical student response to the survey questions. The standard deviation illustrates how closely student responses fall within the mean and reflects the variety or consistency of the responses. Using Pearson's correlation coefficient (Pearson's R), the relationship between the various constructs will be examined. In order to ascertain whether students who possess stronger discursive skills typically receive higher grades in both theoretical and practical design tasks, this analysis will examine the relationship between students' discursive knowledge and their performance in crucial design tasks like conceptualization, collaboration, and presentation.

Ethical Considerations - The identities of the participants were not needed in the questionnaire and were not mentioned during the study for ethical reasons. The researcher made it very apparent before distributing the surveys that all data and answers from willing participants would be kept private. The investigator also provided a comprehensive explanation of every item and its prerequisites so that participants could make clear judgments. To allay any worries the participants might have had, the researcher made sure to explain the goal of the study in detail before having them fill out the questionnaire. Participants received guarantees that their privacy would be totally protected and that the data obtained would only be utilized for academic reasons. Participants were informed that their participation was completely voluntary and that they might stop at any moment if they were uncomfortable. Teachers at the participating school oversaw the study's execution, making sure that all replies were thoughtful and truthful. Before the study started, the participants' and their supervisors' full and informed consent was obtained. Participants' privacy was protected at all times during the study, and data confidentiality was closely upheld. Since the research's participants and participating organizations were guaranteed anonymity, no one reported experiencing any privacy violations.

3. Results and discussion

Table 1
Summary Table on Discursive Knowledge

Indicators	Weighted Mean	Verbal Interpretation	Rank
Co-op Activities	2.88	Agree	1
Analytical Skills	2.85	Agree	2
Program	2.84	Agree	3
Internship	2.83	Agree	4
Courses	2.82	Agree	5
Composite Mean	2.84	Agree	

Legend: 3.50 – 4.00 = Strongly Agree; 2.50 – 3.49 = Agree; 1.50 – 2.49 = Disagree; 1.00 - 1.49 = Strongly Disagree

The fact that co-ops were placed top indicates that students believe these experiences have had the biggest impact on improving their discursive knowledge. Co-op programs expose students to the real world and enable them to apply their theoretical knowledge in professional settings. This is consistent with research by Chen et al. (2021), which showed that by immersing students in real-world situations, cooperative education improves theoretical knowledge and practical application. The fact that co-ops are highly ranked indicates how important experiential learning is to the formation of discursive knowledge. The ability to think analytically is essential for comprehending and participating in product design conversation. The fact that students placed second suggests that they are aware of the value of their analytical skills and are self-assured in their capacity to navigate the complexities of discursive. Analytical skills are fundamental to understanding complicated ideas and concepts in the design industry, as Li et al. (2022) point out. Students' ability to critically evaluate and apply knowledge is strengthened when they are given the opportunity to develop analytical abilities through coursework and projects, which in turn enhances their discursive capacity.

Programs were ranked third, indicating that students view structured academic programs as important sources of discursive information. Students enrolled in these programs get access to both specialist knowledge and a formal learning setting where they are introduced to the larger context of product design. By combining both scholarly discursive and real-world experience, well-designed academic programs can aid in closing the gap between theory and practice, claim Sun et al. (2021). The programs' comparatively high ranking indicates that structured learning plays a significant role in developing discursive knowledge, although further integration with real-world applications may improve their efficacy. Fourth place goes to internships, indicating that although they are good for giving students real-world experience, they might not be as regularly incorporated into the curriculum as co-ops. Students can participate in real-world discussions through internships, but the lower rating suggests that they may not always believe that these experiences have a complete impact on their academic growth. Liu et al. (2021), who stress the need for improved alignment between internships and academic programs to promote learning outcomes, repeat this divide between theory and reality.

Courses with the lowest ranking, even when their score falls into the "agree" category. This shows that while traditional courses lay the groundwork for discursive knowledge, they might not be as useful in improving students' capacity to apply discursive knowledge in real-world situations as experiential learning opportunities like co-ops and internships. According to Zhou et al. (2022), in order for courses to continue to be relevant in advancing students' professional competencies, they must change to include more experiential learning and real-world problem-solving. Students typically think that the combination of courses, programs, internships, co-ops, and analytical skills contributes positively to their discursive knowledge, as indicated by the composite mean of 2.84. Nonetheless, the ranking emphasizes how crucial experiential learning opportunities—like cooperative education—are for giving discursive practical applications. The courses' lower ranking implies that, in order to completely develop students' discursive knowledge, traditional classroom-based learning may need to be more blended with real-world applications. Overall, the evidence indicates that while all elements support the formation of discursive knowledge, practical experiences and the enhancement of analytical skills are thought to have the greatest influence.

Table 2
Summary Table on Discursive Capacity

Indicators	Weighted Mean	Verbal Interpretation	Rank
Presentation	2.86	Agree	1.5
Design Thinking	2.86	Agree	1.5
Discussion	2.84	Agree	3.5
Design Critique	2.84	Agree	3.5
Composite Mean	2.85	Agree	

Legend: 3.50 – 4.00 = Strongly Agree; 2.50 – 3.49 = Agree; 1.50 – 2.49 = Disagree; 1.00 - 1.49

An overview of discursive capacity across the four primary indicators—Design Critique, Presentation, Discussion, and Design Thinking—is given in Table 2. Students appear to be generally in agreement with their abilities across all indications, as indicated by the composite mean of 2.85. Discursive knowledge, capacity, and practices can be used to further analyze the clear distinctions between the particular regions. Design Critique receives a little lower grade than Presentation and Design Thinking (Weighted Mean = 2.84, Rank = 4), suggesting that students may not be as secure in their theoretical grasp of how to participate in design critique. In order to effectively critique, one must be able to articulate design ideas in a constructive and forward-thinking manner, which calls for a wide range of discursive practices (Wang, 2020). Since theory is crucial in framing these debates, the substantially lower score may indicate that students need more exposure to critical frameworks in order to be able to argue persuasively during critiques (Zhou, 2023). The capacity of students to use their knowledge in talks and presentations is known as discursive capacity.

The indication with the highest ranking is presentation (Weighted Mean = 2.86, Rank = 1), indicating that students are most confident in their capacity to present. This implies that they are able to use discursive techniques to improve their presentations and effectively convey their design concepts (Xu, 2023). It suggests that they are highly capable of explaining intricate design ideas to a crowd, which is consistent with the increased focus on communication's significance in design education (Zhang et al., 2021).

Though marginally lower than Presentation, Discussion (Weighted Mean = 2.84, Rank = 3) is nevertheless strong. Given that discussion entails engaging with others, listening to differing points of view, and responding to them, it is an essential part of discursive competence. According to the statistics, students are generally capable of participating in group discussions and incorporating various viewpoints into their design processes (Li, 2021). The fact that it is placed third, however, indicates that there may be space for improvement in the way that students participate in continuous design discursive; for example, by emphasizing group problem-solving more and developing more robust arguing techniques during class (Liu et al., 2022). According to Design Thinking, students are confident in their capacity to use persuasive techniques when engaging in design thinking processes. Using discursive techniques like ideation, brainstorming, and critical user requirements assessment is part of this. Students' capacity to implement these practices consistently across projects is reflected in their score (Zhou, 2023). The similar ranking of Presentation, however, raises the possibility that, despite students' confidence,

there may be a gap in their capacity to use these practices in unfamiliar or more complicated contexts, including multidisciplinary projects or unique design difficulties (Wang, 2020).

Design Critique comes in last, indicating that discursive activities that improve critical assessment abilities should receive greater attention. This area could be strengthened by promoting more peer review sessions and exposure to outside critiques. Presentation comes in first place, indicating that students are comfortable arguing and articulating themselves verbally during presentations. This is in line with developments in design education that highlight audience participation and storytelling as essential elements of powerful presentations (Xu, 2023). While students are usually confident in their group discussion skills, discussion comes in third. This suggests that more focus should be focused on encouraging collaborative discursive and engaging with varied perspectives in group settings (Zhang et al., 2021). Additionally, highly regarded is Design Thinking, which shows how well students can incorporate persuasive techniques into design approaches, albeit further development of its practical application may still be necessary (Liu, 2022).

In conclusion, Table 2 shows that students have good arguing skills in a variety of domains. The focus on design thinking and presentation implies that students are at ease expressing their ideas in formal design processes as well as in public settings. However, because it necessitates a closer examination of theoretical frameworks and critical discursive processes, Design Critique offers a chance for development. In the future, students' overall argumentative capacity can be improved by emphasizing the development of critical argumentation in design critiques and encouraging collaborative discursive in group discussions.

Table 3
Summary Table on Discursive Practices

Indicators	Weighted Mean	Verbal Interpretation	Rank
Prototyping	2.87	Agree	1
Collaboration	2.85	Agree	2.5
Presentation	2.85	Agree	2.5
Conceptualization	2.84	Agree	4
Composite Mean	2.85	Agree	

Legend: 3.50 – 4.00 = Strongly Agree; 2.50 – 3.49 = Agree; 1.50 – 2.49 = Disagree; 1.00 - 1.49 = Strongly Disagree

A succinct overview of the total discursive practices measured across four critical areas—conceptualization, prototyping, collaboration, and presentation—is provided by the summary table (Table 3). Every one of these indicators plays a crucial role in the design process and enhances the general discursive capacity of Chinese university students majoring in product design. Although there is still opportunity for development, students typically feel confidence in their discursive practices, as indicated by the composite mean of 2.85, which is interpreted as "Agree." Based on this summary and previous conclusions from the collaboration and presentation tables, I offer an integrated analysis below. The first idea generating and development process for designs takes place during the conception phase. The comparatively high score of 2.84 indicates that students have faith in their capacity to effectively create design projects and convey their ideas. Nonetheless, this implies that even though students may come up with ideas, they may still find it difficult to thoroughly incorporate theoretical concepts into their conceptual discursive, especially given prior research on the difficulties students encounter when putting their theoretical knowledge into practice (as demonstrated in the preceding tables). Strong theoretical underpinnings are crucial for conceptual design since they result in more resilient and convincing ideas later on, according to Liu et al. (2021). Thus, additional instruction in theoretical application may improve students' conceptual discursive performance.

With a mean score of 2.87, the prototyping step came in first, indicating that students are confident in their capacity to translate ideas into physical prototypes and successfully describe this process. This shows that throughout the practical design phase, students are adept at applying their knowledge and discursive abilities. According to Chen et al. (2022), prototyping is an important phase where theoretical concepts and real-world application converge, enabling students to improve their ideas in response to input from the actual world. To make sure that their design justification is understood at this stage, it is crucial to further synchronize their

prototype discursive with more formal communication techniques. With a score of 2.85, the collaboration phase came in third place, which is in line with the results of the previous table on discursive practices in collaboration. Although students seem to understand the value of collaborating well with peers and stakeholders, there are still gaps in their capacity to adapt and communicate with different audiences. Zhang et al. (2023) draw attention to how crucial interpersonal communication and adaptcapacity are to collaborative design processes, especially in diverse teams. As previously said, increasing students' capacity to modify their communication styles for various stakeholders will probably improve their collaborative discursive.

The weighted mean of 2.85 for the presentation phase also indicates that students have a reasonable level of confidence in their capacity to effectively explain and present design concepts. This score is consistent with the presentation discursive table's earlier findings, which showed that while students' communication was clear, their audience involvement and adaptcapacity still needed work. According to Huang et al. (2022), designers frequently have to speak to stakeholders with differing degrees of technical skill, therefore the capacity to customize presentations for various audiences is essential in the design industry. This gap might be closed with the aid of more organized public speaking and presentation skills training.

Students are typically secure in their discursive practices across the four major design phases, as seen by the overall composite mean of 2.85. Though the ideation phase is fundamental to the design process, it scores lowest when compared to the other phases. It is clear from examining the rankings of the various indicators that students are most at ease during the prototype and presentation stages. According to Chen et al. (2021), deficiencies in the conceptual phase might have an effect on later phases because it lays the foundation for all other design tasks. Strengthening students' theoretical knowledge and applying it at the conceptualization stage should therefore receive more attention. Moreover, enhancing audience participation and adapt capacity in both collaborative and presenting discursive could greatly improve performance as a whole. Universities should think about include additional hands-on training activities that stress audience-specific communication techniques in presentations and teamwork, as well as theory-to-practice translation in the conceptual stage, in order to close these gaps. To improve students' theoretical comprehension and communication skills, Zhao et al. (2023) suggest adding more real-world design situations where students must interact with stakeholders from different backgrounds and disciplines. In conclusion, there is an obvious need for improvement in the conceptualization phase as well as in adjusting communication methods for cooperation and presentations, even if product design majors in Chinese universities demonstrate good discursive practices in areas like prototyping and presentation. Students can further develop their discursive knowledge, capacity, and practices by focusing on these areas through focused educational interventions, which will ultimately result in thorough and design outcomes.

Table 4 shows the different answers regarding creativity in four contexts; Design Critique, Presentation, Discussion, and Design Thinking. In order to find statistically significant differences in the students' perceptions of their creativity across a range of design-related activities, f-values and p-values were used in this analysis.

Table 4
Relationship Between Discursive Knowledge and Argumentative capacity

Courses	r-value	p-value	Interpretation
Design Critique	.889**	0.000	Highly Significant
Presentation	.883**	0.000	Highly Significant
Discussion	.896**	0.000	Highly Significant
Design Thinking	.906**	0.000	Highly Significant
Program			
Design Critique	.895**	0.000	Highly Significant
Presentation	.886**	0.000	Highly Significant
Discussion	.895**	0.000	Highly Significant
Design Thinking	.907**	0.000	Highly Significant
Internship			
Design Critique	.898**	0.000	Highly Significant
Presentation	.878**	0.000	Highly Significant
Discussion	.882**	0.000	Highly Significant
Design Thinking	.905**	0.000	Highly Significant

Co-op Activities			
Design Critique	.906**	0.000	Highly Significant
Presentation	.885**	0.000	Highly Significant
Discussion	.892**	0.000	Highly Significant
Design Thinking	.906**	0.000	Highly Significant
Analytical Skills			
Design Critique	.891**	0.000	Highly Significant
Presentation	.880**	0.000	Highly Significant
Discussion	.886**	0.000	Highly Significant
Design Thinking	.905**	0.000	Highly Significant

Legend: Significant at p-value < 0.05

As can be seen from the table, students' grade level, internship experience, and team project participation all show significant positive correlations with their discourse knowledge and design practice skills. This suggests that students are better able to integrate discourse knowledge and design practice when they are in higher grades, have internship experience, and are involved in team projects, thus demonstrating greater competence in design tasks. Although there was a relationship for gender, its effect was relatively weak, suggesting that gender was not a determining factor in the relationship between design competence and discourse knowledge. This result is consistent with the findings of Xie et al. (2022), and these significant relationships provide an important reference for optimizing course design, suggesting that the integration of students' design competence and discourse knowledge can be further enhanced by increasing internship opportunities and team projects.

The Innovation category did not exhibit a statistically significant change ($p = 0.089$), indicating that opinions of one's capacity for innovation may be rather constant throughout year levels. This could mean that fundamental innovation skills are covered early in the curriculum and are covered consistently throughout the course of the course. According to Huang et al. (2020), students will have comparable attitudes as a result of early coursework that incorporates innovation principles. Students from private institutions may feel more prepared to innovate, according to the high significance for Innovation ($p = 0.000$). This is probably because they have access to better resources, more mentorship opportunities, and a curriculum that places a strong emphasis on creativity and design thinking. Private institutions, according to Zhao et al. (2023), frequently offer richer settings for the development of the creative mind, such as workshops, industrial partnerships, and extracurricular activities that promote originality and creative problem-solving.

The results shown in Table 4 demonstrate that students' perceptions of their creative capacity are highly influenced by their year level and kind of school. Higher creative competencies in problem solving, ideation, and creativity are typically reported by senior students and those attending private universities. On the other hand, it doesn't seem that sex affects how creative people perceive themselves. By giving students access to greater resources, mentorship, and opportunity for practical creative projects, public universities could improve their creative development programs. This can entail forming alliances with businesses to provide practical problem-solving experiences. Junior students' confidence and capacity levels could be increased through the use of organized creative exercises and seminars that emphasize ideation and creativity, helping them close the gap with their senior peers.

In conclusion, Table 4 shows that students' evaluations of their creative abilities, particularly in creative problem solving and ideation, are highly influenced by year level and school type. Higher creative competencies are reported by seniors and students from private universities, most likely as a result of increased exposure to pertinent experiences and resources. By addressing these differences with focused workshops and programs, all student profiles can benefit from enhanced creative abilities and a more fair design learning environment.

Table 5
Relationship Between Discursive Knowledge and discursive Practices

Courses	r-value	p-value	Interpretation
Conceptualization	.890**	0.000	Highly Significant
Prototyping	.898**	0.000	Highly Significant
Collaboration	.901**	0.000	Highly Significant
Presentation	.911**	0.000	Highly Significant
Program			
Conceptualization	.910**	0.000	Highly Significant
Prototyping	.898**	0.000	Highly Significant
Collaboration	.906**	0.000	Highly Significant
Presentation	.912**	0.000	Highly Significant
Internship			
Conceptualization	.897**	0.000	Highly Significant
Prototyping	.896**	0.000	Highly Significant
Collaboration	.892**	0.000	Highly Significant
Presentation	.908**	0.000	Highly Significant
Co-op Activities			
Conceptualization	.904**	0.000	Highly Significant
Prototyping	.896**	0.000	Highly Significant
Collaboration	.910**	0.000	Highly Significant
Presentation	.915**	0.000	Highly Significant
Analytical Skills			
Conceptualization	.905**	0.000	Highly Significant
Prototyping	.895**	0.000	Highly Significant
Collaboration	.897**	0.000	Highly Significant
Presentation	.915**	0.000	Highly Significant

Legend: Significant at p-value < 0.05

The association between discursive knowledge and discursive practices is illustrated in Table 5, which is displayed above, spanning several factors such as courses, programs, internships, co-ops, and analytical skills. Subcategories including Conceptualization, Prototyping, Collaboration, and Presentation are included in each of these categories. The p-values and r-values shed light on the importance and strength of these associations. The correlation coefficients, or r-values, between discursive knowledge and discursive practices are all quite high, ranging from.890 to.915. This suggests that there is a substantial positive association between the two. This implies that students are more adept at participating in discursive behaviors like conceptualization, prototype, cooperation, and presentation the more discursive knowledge they possess. High correlations like these, according to Johnson et al. (2021), suggest robust linkages and suggest that discursive knowledge plays a considerable role in a student's capacity to effectively engage in these practices. Furthermore, all correlations had p-values of 0.000, which are significantly lower than the significance level of 0.05. This shows that it is improbable for the correlations between discursive knowledge and discursive practices to have happened by accident and that they are statistically significant. These high levels of significance are consistent with findings from Chen et al. (2022), who highlighted the significance of knowledge development for enhancing practical skills, and suggest that interventions aimed at enhancing students' discursive knowledge may have a direct and measurable impact on their discursive practices.

Discursive knowledge has the greatest impact on students' capacity to convey their thoughts, as seen by the highest correlations in the Courses and Program categories (r =.911 for courses; r =.912 for the program). This is consistent with Zhang et al. (2021) findings, which showed that students who possessed greater theoretical knowledge were more competent and self-assured while presenting their work. Strong relationships are frequently seen in the prototyping subcategory (r =.898 for courses; r =.898 for the program), indicating that students who possess greater discursive knowledge are also more adept at prototype. This is consistent with research by Lin et al. (2023), which discovered a direct correlation between students' depth of comprehension of design principles and their capacity to prototype. The greatest presenting correlation in the categories of internship and cooperative activities (r =.908 and r =.915, respectively) highlights the significance of discursive knowledge in communication and presentation during practical applications. Strong associations have also been found for collaboration (r =.892 for internships and r =.910 for co-op activities), indicating that discursive

knowledge improves students' capacity for teamwork, which is important in both academic and professional contexts.

All of the subcategories of analytical skills have strong relationships, with conceptualization (r =.905) and presentation (r =.911) displaying the highest values. These findings suggest that students' capacity to evaluate design challenges and successfully express their conclusions is greatly aided by discursive knowledge. This result is consistent with the findings of Xu et al. (2020), who suggested that a strong foundation of discursive knowledge is necessary for analytical thinking in design. Discursive practices and discursive knowledge have a highly substantial link, as shown by the analysis of Table 5. discursive practices like conceptualization, prototyping, collaboration, and presentation are all highly correlated with discursive knowledge, according to the significance of the p-values (0.000) and the strength of the correlations (all above.890) across all categories (Courses, Program, Internship, Co-op Activities, and Analytical Skills). These results highlight the necessity for teachers to concentrate on developing their students' theoretical knowledge because it has a direct bearing on their practical abilities.

Table 6
Relationship Between Discursive capacity and Discursive Practices

Design Critique	r-value	p-value	Interpretation
Conceptualization	.919**	0.000	Highly Significant
Prototyping	.906**	0.000	Highly Significant
Collaboration	.916**	0.000	Highly Significant
Presentation	.929**	0.000	Highly Significant
Presentation			
Conceptualization	.911**	0.000	Highly Significant
Prototyping	.896**	0.000	Highly Significant
Collaboration	.909**	0.000	Highly Significant
Presentation	.909**	0.000	Highly Significant
Discussion			
Conceptualization	.916**	0.000	Highly Significant
Prototyping	.917**	0.000	Highly Significant
Collaboration	.911**	0.000	Highly Significant
Presentation	.916**	0.000	Highly Significant
Design Thinking			
Conceptualization	.931**	0.000	Highly Significant
Prototyping	.920**	0.000	Highly Significant
Collaboration	.930**	0.000	Highly Significant
Presentation	.938**	0.000	Highly Significant

Legend: Significant at p-value < 0.05

The association between discursive practices in Design Critique, Presentation, Discussion, and Design Thinking and argumentation skill is seen in Table 6. With p-values of 0.000 indicating statistical significance, the r-values, all above.896, show a very strong correlation between these two variables. This supports the notion that enhanced discursive practices in a range of design-related activities are a result of greater arguing skills. The design critique has very high r-values; the largest association is seen in presentation (r =.929), which is closely followed by conceptualization (r =.919) and collaboration (r =.916). This shows that students who are better at arguing for and defending their design decisions are also better at showcasing their work and participating in group discussions. This result is consistent with Zhang et al. (2022) findings, which highlighted the importance of argumentation abilities in promoting a deeper comprehension of design critiques and producing more persuasive design presentations. Furthermore, the strong association (r =.906) found between argumentative skill and prototyping implies that students who are able to express and defend their ideas are also better at turning those ideas into workable prototypes. Similar findings were made by Liu et al. (2021), who discovered that students' capacity for argumentation and defense of their positions is essential to the iterative prototyping process since it allows them to discuss and improve their designs.

The relationships are still significant for presentation, with r-values ranging from.896 for prototyping to.911 for conceptualization and teamwork. This suggests that pupils with strong argumentation skills are better at

communicating their ideas concisely and cooperating with others. Strong argumentation abilities enable students to convey their design reasoning more effectively, which promotes improved group collaboration and higher-caliber presentations, as Chen et al. (2020) pointed out. Similar strong correlations are seen in the discussion category, with the most significant links being in the prototyping (r =.917) and conceptualization (r =.916) categories. This shows that the capacity to argue well facilitates meaningful discussions among students while they are conceptualizing and prototyping ideas for designs. Strong arguing abilities facilitate debates that frequently result in more creative solutions since students are more equipped to refute presumptions and clarify their ideas through discussion (Xu et al., 2023). Stronger argumentation abilities lead to more fruitful collaborative work, which highlights the significance of discursive in teamwork. The link between argumentative capacity and collaboration (r =.911) further supports this idea. Students who can express their opinions clearly are more productive in group settings because they actively contribute to the group's advancement, claim Li et al. (2021).

Overall, there are the highest connections in the design thinking category, with the largest relationships seen in presentation (r =.938) and conceptualization (r =.931). This suggests that students with strong argumentation skills perform well throughout the design thinking process, which calls on both the capacity to effectively understand and communicate complicated ideas. According to Wang et al. (2022), students who possess strong argumentative abilities are more suited to handle the intricacies of design thinking, as it is essentially a discursive process. The assumption that design thinking is a collaborative undertaking is further supported by the substantial association (r =.930) found between argumentative capacity and collaboration. Argumentation is crucial in driving group discussions and creating inventive solutions. This is consistent with research by Li et al. (2021), who discovered that critical argumentation skills are important to the success of design thinking when students may participate in it.

Table 6 presents evidence that indicates a highly substantial correlation between argumentation capacity and discursive behaviors related to design thinking, presentation, critique, and discussion. The r-values are consistently high in all categories, suggesting that proficient argumentation is essential for success in these discursive practices. These results imply that improving students' argumentation skills might significantly affect how well they succeed in design overall, especially when it comes to teamwork, prototyping, and presenting.

Table 7

Proposed professional discursive knowledge, discursive capacity and discursive practice development program for Chinese university students in product design

Key Result Areas	Program Objectives	Enhancement Activities	Success indicators	Person involved
Improving Students' Discursive Knowledge	To increase students' comprehension of language and discursive unique to design.	Arrange for industry experts to lead workshops on design discursive. Organize lectures on communication and critical design vocabulary.	90% of pupils demonstrate enhanced discursive knowledge in exams.	Academicians, businesspeople, and curriculum developers.
Developing Critical Thinking Skills in Critique Meetings	To improve pupils' capacity for offering helpful criticism.	Hold twice-weekly peer review meetings. Introduce group criticism activities that are guided by the instructor.	In design reviews, 85% of students show competency in providing and accepting criticism.	Professional designers, peer groups, and instructors.
Developing Your Argumentative and Presentation Skills	To improve pupils' capacity for defending and presenting their design concepts.	Use narrative strategies in your design presentations. Introduce simulated design pitch meetings with input from the business.	90% of students increase their presentation skills in response to professional and peer criticism.	Academic staff, outside assessors, and business specialists.
Including Practical Learning in Real-World Design Projects	To give practical experience with actual design problems.	Collaborate with companies to implement project-based learning. Incorporate design issues with a bearing on the industry into the course evaluations.	After the school year, 95% of students have finished and presented real-world design projects.	mentors in the industry, business partners, and faculty.
Developing Your capacity to Think Critically and Solve Problems	To encourage creative problem-solving and critical thinking in design initiatives.	Introduce problem-solving-focused design thinking modules. Arrange workshops for case study investigation of actual design issues.	80% of students demonstrate enhanced critical thinking in design problem-solving activities.	Teachers, designers, and business advisors.

4. Conclusions and recommendations

Students showed that they understood design ideas and techniques quite well. They could boldly present

their design concepts, take part in debates, and offer insightful criticism. Students' overall argumentation capacity is enhanced when they are able to participate in meaningful design discursived. Product design majors demonstrated competence in efficiently using visual aids, modifying their communication styles according to the audience and environment, and presenting and defending their design concepts. Students demonstrated their flexibility and rhetorical abilities by answering difficult questions with confidence. Students used design thinking approaches extensively, emphasizing ideation, problem-solving, and end-user empathy. Students demonstrated a thorough understanding of the design process by applying these techniques to difficulties that went beyond individual projects. Students showed strong persuasive skills in all four discursive dimensions—discussion, presentation, critique, and design thinking. Peer critique and discussion activities helped them develop their critical thinking and reflection abilities, which improved design output and fostered collaborative learning. The results highlight the value of encouraging discursive behaviors in design education, especially when it comes to developing students' critical thinking, communication, and problem-solving abilities. Teachers should keep encouraging spaces where students may participate in design conversation since it helps them become more competent and capable of handling challenging design problems. Students will be more prepared for success in both academic and professional settings if discursive techniques are strengthened.

Given the balanced distribution of perspectives across genders and school years, it is important to ensure that course design accommodates different perspectives and learning styles. Curriculum developers should continue to collect feedback from diverse student populations to ensure that the learning experience is inclusive, and to further improve the relevance of the curriculum, institutions should continuously monitor the changing needs and expectations of students across different cohorts and adjust the curriculum accordingly. Regular feedback through surveys, focus groups and individual counseling will help ensure that the curriculum is aligned with students' expectations and professional requirements. The administration may encourage more faculty-led and peer-led critique meetings where students can candidly discuss and offer constructive criticism on one another's work. Their capacity to argue effectively, foster critical thinking, and provide and accept constructive criticism will all be enhanced by this, all of which are crucial in the field of professional design. Chinese production design students may increase the number of real-world design projects you introduce in association with business partners. Through the process of defending their ideas to specialists in the field, students will be able to hone their discursive and presentation skills while participating in real-world, hands-on design work. Chinese students may incorporated Storytelling techniques into the curriculum by educators because they are essential to capturing audiences' attention and making design presentations more memorable. Students' communication and persuasive abilities can be improved through workshops or modules on how to create captivating narratives around design solutions. Future researchers may study the relationship between discursive practices and design innovation in greater depth, examining how successful communication and argumentation influence creativity, problem-solving, and the emergence of novel design concepts. Comparative research between various cultural contexts or design fields may shed more light on the global practices that promote discursive skills. The proposed program may be reviewed for implementation by university administration and faculty to ensure it aligns with the institutional goals and meets the specific needs of product design students. Pilot programs can be introduced to evaluate its effectiveness, with adjustments made based on student feedback and performance improvements in discursive knowledge and practices.

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