Improving Digital Learning in Higher Education: Students' Perspectives on Design Thinking Using Q-Methodology

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Abstract

This study examined and categorized the views of undergraduate college students in the Philippines and correlated those with similar patterns of views regarding the use of Design Thinking (DT) in their Philosophy course. The Q-Methodology was used to analyze qualitative data using PQMethod (Schmolck & Atkinson, 2013) software quantitatively. Twenty-five students were surveyed, interviewed, and invited to rank-order 36 statements about the use of DT in their Philosophy course. Three factor types were identified: (1) Groundswell Bootstrap Designers, (2) Prolegomenal Design Thinkers, and (3) Non-Designer Humanitarians. A fourth factor, named Recalcitrant Colliders, though non-loader and unflagged, was included among the factor types to show that the participants within this group held unique and hybrid perspectives on DT that are worthy of consideration. The results revealed that students find DT as a transformative way of learning creative and critical thinking, empathy, and problem-solving skills. The study concluded that DT in higher education is viewed as a valuable platform for improving the learning experience of students as they navigate the future of digital learning. To ensure meaningful learning, we recommend making DT mainstream rather than peripheral, responding to the call for digital transformation in the 21st century. The findings of this research are important for theory, practice, policy, and subsequent research.

Keywords – design thinking; Q-Methodology; concourse statements; COVID-19 pandemic; Q sort

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Introduction

The COVID-19 pandemic has significantly changed various aspects of our lives, including the delivery of tertiary education (Severino et al., 2021). As we navigate the post-pandemic era, exploring innovative approaches to enhance higher education learning is crucial. Design Thinking (DT[1]) has emerged as a promising pedagogical tool that can transform education across disciplines and age groups (Affouneh et al., 2020; Albay & Eisma, 2021; Revano & Garcia, 2020).

Design Thinking is a human-centered approach to innovation, a creative method, and a problem-solving technique, emphasizing empathy to fully understand people's pain points (Panke, 2019). It is anchored in the goal of identifying the needs of people, ideating creative designs, prototyping, and engaging in iterative processes – all meant to improve the lives of people and help find solutions for local, national, or global issues (Leinonen & Gazulla, 2014). In a time of rapid technological advancement, DT went digital and gained popularity for use in educational settings (Albay & Eisma, 2021; Callahan, 2019; Dorst, 2011; Ejsing-Duun & Skovbjerg, 2019; Kimbell, 2011; Leinonen & Gazulla, 2014; Panke, 2019; Revano & Garcia, 2020). A cursory review of prior experimental research showed well-documented positive effects of DT across disciplines and learners (Albay & Eisma, 2021; Beligatamulla, 2021; Bhandari, 2022; Ladachart et al., 2022; Leinonen & Gazulla, 2014; Magistretti et al., 2022). Specifically, several studies revealed that DT boosts learning motivation and promotes knowledge acquisition (Beckman & Barry, 2007; Beligatamulla, 2021; Burdick & Willis, 2011; de Vries, 2021; Pusca & Northwood, 2018; Revano & Garcia, 2020, Shanta & Wells, 2022; Wells, 2016, 2021). Evidence likewise showed that, compared to traditional lectures, DT positively impacted students' higher-order thinking skills (Ericson, 2022). However, understanding the full potential and impact of DT in the context of digital learning (better known as e-learning that utilizes digital technologies and electronic resources to facilitate and enhance the learning experience) requires further investigation.

This research examined how students perceived and experienced DT in the context of a Philosophy course. To capture students' diverse perspectives, we employed Q-methodology, a research method developed by William Stephenson (1980). Q-methodology offers a unique approach by focusing on how individuals construct and perceive a specific phenomenon, providing a deeper understanding than traditional Likert scale surveys (Stergiou & Airey, 2011).

In recent years, while Q-methodology has been successfully employed in fields such as marketing research (Armatas et al., 2014; Chang et al., 2019; Chikudza et al., 2020; Kim & Lee, 2015) and political science (Balch, 1982; Brown, 2019; McKeown, 1984), its use in researching DT within an educational context has remained relatively limited. Consequently, this study utilized Q-methodology to

[1] Throughout this paper, when we mention DT, we specifically refer to Design Thinking.

investigate the integration of DT in higher education by analyzing student insights and diverse views on DT. The strength and uniqueness of the Q-methodology lies in its ability to correlate people rather than merely linking items or variables. This comprehensive approach allows for a more nuanced understanding of students' perspectives on DT, paving the way for meaningful contributions to the discourse on integrating DT into education.

By exploring students' experiences and perceptions of DT in a Philosophy course, this study contributes to the broader understanding of how DT can be effectively incorporated into higher education beyond the COVID-19 pandemic. The findings can inform educators and policymakers about DT's potential benefits and limitations in fostering innovative and engaging student learning experiences.

Literature Review

A literature survey revealed a growing body of research highlighting the effectiveness of well-designed digital learning environments in promoting students' creativity and innovation (Callahan, 2019; Dorst, 2019; Gunn, 2019; Pusca & Northwood, 2018; Sung & Kelley, 2019) as well as enhancing their soft skills, including empathy, teamwork, and non-linear problem-solving abilities (Albay & Eisma, 2021; Angheloiu et al., 2020; Baker III & Moukhliss, 2020; Devecchi & Guerrini, 2017; Dorst, 2019; Kouprie & Visser, 2009; Noel, 2021). With the shift to remote learning during the COVID-19 pandemic in 2020, DT has reemerged as a popular pedagogical approach in academia to facilitate students' learning and problem-solving (Baker III & Moukhliss, 2020).

As a problem-solving approach, DT aims to solve a problem to contribute positively to an increasingly complex and technological society (Bhandari, 2022; Dorst, 2011, 2019; Gobble, 2014; Leinonen & Gazulla, 2014; Reed, 2016). It attempts to produce creative solutions to what are called "wicked problems" (Rittel & Webber, 1973; Buchanan, 1992; Pusca & Northwood, 2018) or "ill-structured problems" (Simon, 1973). After identifying a problem and proposing a potential solution, designers can prototype and test their ideas by iteratively improving their designs through real-world testing (Collins et al., 2004).

Design Thinking is a problem-solving approach emphasizing empathy, creativity, and iterative processes to develop innovative solutions. While it is more commonly associated with technological and engineering design, its principles can also be applied to philosophy courses (Vial, 2015). DT transforms abstract philosophical ideas into tangible, practical solutions, bringing philosophy's complex thinking to inform its practical application. At its core, it encapsulates the philosophical underpinnings of critical thought, empathy, and creativity, taking the theoretical realm of philosophy and bringing it to life through a structured problem-solving approach (Wang, 2013). In this convergence of philosophy and design (Dalsgaard, 2014; Kamran, 2018; Thakker, 2020), educators discovered a potent pedagogical tool that resonated

with students. By employing DT in philosophy courses, educators unlocked a myriad of educational benefits. Students were encouraged to question assumptions, challenge prevailing beliefs, and think critically. They developed a nuanced understanding of philosophical concepts through active exploration and iteration. Furthermore, DT nurtured empathy and perspective-taking, which are the fundamental aspects of both philosophy and design (Jamal et al., 2021).

The convergence of philosophy and design thinking also opened up opportunities for creativity and innovation (Beligatamulla, 2021; Kamran, 2018). Students engaging in DT are encouraged to think beyond traditional boundaries, explore multiple ideas, and envision novel approaches to philosophical problems. This process empowers them to develop fresh insights and forge new interpretations, breathing new life into timeless philosophical concepts. Moreover, collaboration and dialogue flourish within the framework of DT. By leveraging interdisciplinary approaches and collaborative teamwork, students engage in dynamic group discussions (Mentzer & Mohandas, 2022). They tap into the collective intelligence of their peers, benefitting from diverse perspectives and enriching their philosophical exploration. The emphasis on real-world applications in DT encourages students to consider how philosophical ideas can be meaningfully applied to contemporary issues. By grounding philosophical concepts in practicality, students cultivate a deeper engagement with the subject matter and a heightened sense of relevance (Beligatamulla, 2021).

Considering the limited number of research studies directly addressing Design Thinking (DT) as an integral part of teaching philosophy, further exploration of the connection between DT and philosophy emerges as a fertile area for research. This study was designed to investigate undergraduate students' perceptions of DT in a Philosophy course during the COVID-19 pandemic when online learning had become prevalent. By exploring students' perspectives, common patterns of views regarding DT were identified, along with factors that influenced these perspectives. This research contributes to understanding the potential of DT as an effective digital teaching/learning tool and informs the future of education beyond the pandemic (McLaughlin et al., 2019; Thakur et al., 2021).

Method

Using Stephenson's Q-Methodology, this study investigated the subjective opinions of students enrolled in an undergraduate Philosophy course delivered in the Philippines during the COVID-19 pandemic on the effectiveness of DT. To ensure all participants had a thorough understanding of DT, only those having completed the DT-integrated philosophy course were included in the study. Integrated into the instructional design of the philosophy course, the process of design thinking was fully addressed, emphasizing its problem-solving and

learner-focused approach, using real-world examples. This allowed students to apply DT to philosophical questions and recognize how it enhances analysis.

Q-methodology is a mixed research method that combines quantitative analysis of subjective or qualitative data. Unlike Likert-scale surveys that aggregate views into a singular viewpoint, Q-methodology is specifically designed to reveal and describe the multiple perspectives within a group of people (Exel & Graaf, 2005; Watts & Stenner, 2005; Willig & Rogers, 2017; Zabala, 2014). Developed by Stephenson (1980), Q-methodology is a strategy that combines sorting techniques and factor analysis methods. This study sought to reveal what participants determined was meaningful from their individual perspectives (Watts & Stenner, 2005) and capture the subtleties of their expressed viewpoints on the effectiveness of DT for promoting deeper understanding of the concepts addressed in a Philosophy course during the pandemic.

Participants

The survey on students' views regarding their use of DT as a learning tool in Philosophy classes was extended to 13 sections of the philosophy course during the 2nd term, as well as 12 sections during the 3rd term of the school year 2021-2022. This resulted in a total of 875 students afforded the opportunity to complete the survey. Of these potential respondents, 151 completed and submitted their viewpoints on using DT in their Philosophy classes (Table 1).

Table 1.

Demographics of the 151 participants submitting completed surveys

School	**SDA**		**SMIT**		**SHRIM**		**SDG**		**Full Sample**	
Data	n	%	n	%	n	%	n	%	n	%
Gender										
Male	48	32	15	9	8	5	3	2	74	49
Female	58	38	6	4	11	7	2	1	77	51
Other	0	0	0	0	0	0	0	0	0	0
Year Level										
1st	57	38	19	13	17	11	3	2	96	64
2nd	29	19	2	1	1	.6	1	.6	33	22
3rd	12	8	0	0	1	.6	1	.6	14	9
4th	8	5	0	0	0	0	0	0	8	5
Creativity Level										
Designer	81	54	9	6	3	4	1	0	95	62
Non-Designer	25	17	13	8	16	11	2	3	56	38

Note. Demographics reflect participants from all four schools of the college, with 106 from the School of Design and Arts (SDA), 21 from the School of Management and Information Technology (SMIT), 19 from the School of Hotel, Restaurant and Institution Management (SHRIM), and 5 from the School of Diplomacy and Governance (SDG).

Of the 151 survey respondents, 40 were invited to participate in an interview and sorting process. The selection of these 40 students was based on select demographic characteristics (Table 2) intended to ensure a balanced representation of designers and non-designers. The first 25 respondents among these 40 formed the final P-set.

Table 2.

Demographics of the 40 participants drawn from the original pool of 151 individuals

School	SDA		SMIT		SHRIM		SDG		Full Sample	
Data	n	%	n	%	n	%	N	%	n	%
Gender										
Male	6	15	7	18	6	15	3	8	21	53
Female	7	18	5	13	5	13	2	5	19	48
Other	0	0	0	0	0	0	0	0	0	0
Year Level										
1st	7	18	9	23	6	15	3	8	25	63
2nd	3	8	2	5	5	13	1	3	11	28
3rd	2	5	0	0	0	0	1	3	3	8
4th	1	3	0	0	0	0	0	0	1	3
Creativity Level										
Designer	7	18	7	18	4	10	2	5	20	50
Non-Designer	7	18	7	18	4	10	2	5	20	50

Note. This table represents the demographics of the 40 participants representing all four schools of the college, selected as designers or non-designers.

The final set of research participants, referred to as the P-set (Table 3), was comprised of 25 students chosen through stratified sampling from the larger pool of 151 students voluntarily submitting their opinions regarding the use of DT as a pedagogical tool in their Philosophy classes. It is worth noting that Q-methodology typically involves sample sizes ranging from 12 to 30 individuals (Cairns, 2012; Webler et al., 2009).

Table 3.

Demographics of P-set participants.

School Data	SDA		SMIT		SHRIM		SDG		Full Sample	
	n	%	n	%	n	%	n	%	n	%
Gender										
Male	6	24	3	12	5	20	3	12	17	68
Female	3	12	2	8	2	8	1	4	8	32
Other	0	0	0	0	0	0	0	0	0	0
Year Level										
1st	5	20	2	8	7	28	3	12	17	68
2nd	3	12	1	4	0	0	1	4	5	20
3rd	1	4	2	8	0	0	0	0	3	12
4th	0	0	0	0	0	0	0	0	0	0
Creativity Level										
Designer	9	36	0	0	2	8	2	8	13	52
Non-Designer	0	0	5	20	5	20	2	8	12	48

Note. This table represents the demographics of the P-sample representing all four schools of the college, with 9 participants from the School of Design and Arts (SDA), 5 from the School of Management and Information Technology (SMIT), 7 from the School of Hotel, Restaurant and Institution Management (SHRIM), and 4 from the School of Diplomacy and Governance (SDG).

Our selection process was intent on capturing a wide range of viewpoints related to our research question rather than aiming for a representative population sample. To that end, the final P-set reflected a diverse group, consisting of 68% males and 32% females, mostly first-year students (68%), followed by second-year (20%) and third-year (12%) students. The majority (64%) preferred blended learning, while 20% preferred face-to-face and 16% preferred online classes. Moreover, the P-set contained a good balanced between designers (52%) and non- designers (48%). The viewpoints of these 25 participants were subjected to Q methodology analysis to gain insights into their diverse perspectives on DT. Participants were assured of their confidentiality and allowed to withdraw from the study at any time. Consent was obtained through signed consent forms.

Instruments and Data Sets

In Q-studies the Q-set serves as the research instrument, and is comprised of a concourse of statements that participants rank or sort, whereby they express subjective viewpoints on the research topic. According to Stephenson's concourse theory (1980), these statements can come from various sources, such as journal articles, social media posts, surveys, or interviews. In our Q-study, the initial concourse of statements (Q-set) came from the students, while others were

taken from interviews. This initial Q-set, comprised of 36 statements, served as the research instrument administered via email as a Google Form to the 25 participants (P-set). We collected 89 subjective viewpoints on DT. To create the final Q-set from this extensive Q-sample, we employed content analysis and expert validation to ensure clarity (how understandable and unambiguous the statements are to participants) and comparability (participants' ability to compare and rank the statements to express preferences).

Nine DT experts were invited to validate the extracted statements. Their expertise played a vital role in refining the statements to accurately cover the wide range of perspectives related to our study. Following expert validation, we conducted a pretest of the refined Q set for clarity and comparability. This involved inviting one section of 39 students to complete the pretest online. To ensure a fresh perspective, these students were not part of the final P-set. Student pretest responses provided feedback on the understandability of the statements and the extent to which they could compare and rank them. This systematic instrument development process resulted in a Q-sample of 36 concourse statements, with confirmation that it met the criteria of being exhaustive, balanced, and representative (Valenta & Wigger, 1997).

Data Gathering

The 25 participants in the P-set were invited to a ZOOM online meeting for a briefing on the process of Q-sorting, and the procedures for conducting a Q-sort as a method for analyzing the subjectivity and individual perspectives on a particular topic (Gute, 2003). Of the 25, 12 participated in the synchronous Q-sorting, while the remainder opted for asynchronous sorting. The Q-sorting process involves two stages: (1) pre-sorting, where participants categorize the 36 concourse statements into three decks of cards, indicating which statements align closely with their viewpoints and which ones are less representative, and (2) sorting, which involves the final placement of the 36 concourse statements within a quasi-normal distribution with 11 decks, ranging from -5 (indicating strong disagreement) to +5 (indicating strong agreement), with 15 spaces allocated for disagreement, 6 for neutrality, and 15 for agreement. Participants were to position each statement within this Q-sort grid based on their degree of agreement or disagreement with the respective concourse statement. Once satisfied with the placement of the concourse statements, the participant clicked the “submit Q-sort” button. The submitted data were automatically analyzed by the PQM software (Online Q- Methodology Software) for later examination.

While traditional factor analysis assesses correlations among variables, traits, or statements, factor analysis in Q-Methodology is based on correlations among individuals. In this study, we followed the factor analysis procedure outlined in Lutfallah and Buchanan, 2019. This involved the following steps: (1) selection of the type of correlation matrix; (2) choice of factor extraction and

rotation methods, (3) determination of the number of factors, and (4) setting the factor loading thresholds.

The Q-Method software has two options for a correlation matrix: Spearman and Pearson correlation. In this study, the Spearman correlation was used because the gathered data (which are integers ranging between -5 and +5) are ordinal levels. Humphrey's Rule determined the number of factors. Using the formula recommended in Lutfallah and Buchanan (2019), the present study required a minimum factor loading of 0.3266; that is, a factor loading of 0.3266 or higher is considered statistically significant at .05 level. Table 4 shows a truncated correlation matrix of the P-set simplified to focus on specific relationships of interest.

Table 4.

Truncated correlation matrix of the P-set.

Participant	10602	00GWXBZ	4BBIVR	4OOY2	6LWV9T7	70FP
10602	1					
00GWXB7Z	-0.10	1				
4BBIVR	0.10	0.18	1			
4OOY2	0.56	0.08	0.42	1		
6LWV9T7	0.15	0.30	0.57	0.38	1	
70FP	0.43	0.24	0.57	0.56	0.57	1

Note. A correlation coefficient of at least 0.3266 is significant at $p<0.05$.

To keep participant identities confidential, only their assigned codes (pseudonyms) were used. Table 4 shows that participant 10602 has a high correlation with participants 4OOY2 ($r = 0.56$) and 70FP (0.43) but not with participants 00GWXB7Z (-0.10) and 4BBIVR (0.10), among others. Significant factors were obtained using correlation, centroid factor analysis, and varimax rotation. Varimax rotation is a statistical procedure used in factor analysis to explain the relationship among factors. PQM software automatically collates distinguishing and consensus statements for each factor and identifies the participants that belong to each factor based on significant factor loadings.

In-depth interviews were conducted with selected participants following the determination of factor members and interpretation of their responses. A total of four group interviews were carried out to ensure alignment between qualitative and quantitative findings. All interviews, organized by factors, were conducted online and lasted approximately 15 minutes per group, allowing us to gain deeper insights into the Q-sort profiles of participants.

Results

Since design thinking is a relatively new pedagogical tool, its novelty as an instructional strategy is a challenge among students wanting to use it for better understanding what they are learning in their philosophy course. For this purpose, this study examined perceptions held by a sampling of college students regarding the use of DT in their Philosophy class.

Factor analysis identified the number of factors, while correlation analysis showed the students who were highly correlated with one another in each specific factor. The study generated three factor types (Table 5) based on Humphreys' Rule. If the value of Humphrey's rule (Brown, 1980) is twice greater than the standard error of 0.05, that factor is a solution. Twice its standard error of 0.05 is 0.10. Therefore, data analysis based on Humphrey's Rule established as values greater than 0.10 indicated Factors 1, 2, and 3 met this criterion. As such, this analysis indicates that a three-factor solution is appropriate because Humphrey's Rule is less than 0.10 at Factor 4 (0.03519). Table 6 displays the flagged participants generated by the Q-factor analysis, which identified who among the 25 participants loaded onto each of the three factors.

Table 5.

Number of factors based on Humphrey's Rule.

	Factor1	**Factor2**	**Factor3**	**Factor4**
% Explained Variance	26.32843	6.61605	3.99539	5.3450
Humphrey's Rule	0.65957	0.27839	0.14961	.03519
Standard Error	0.05	0.05	0.05	.05

Note. Values of Humphrey's Rule that are less than 0.10 are excluded from the Q factor analysis.

Table 6.

Factor loadings and cross-loadings.

#	Participant	Factor 1	Factor 2	Factor 3
1	4BBIVR	**0.48**	0.09	0.36
2	DG1R	**0.42**	-0.04	0.31
3	K57K41	**0.43**	0.40	0.11
4	SSVSH	**0.37**	0.09	-0.20
5	10602	-0.03	**0.74**	0.27
6	4OOY2	0.41	**0.55**	0.33
7	IIL82M4W	-0.14	**0.74**	0.41
8	OHMV	0.13	**0.35**	0.23
9	QFSUAK	0.16	**0.64**	0.53
10	UUMF	0.18	**0.39**	-0.03
11	00GWXB7Z	0.21	-0.18	**0.40**
12	6LWV9T7	0.45	-0.04	**0.66**
13	70FP	0.35	0.44	**0.59**
14	9L6DRA78	0.29	0.11	**0.52**
15	A90B	0.16	-0.15	**0.58**
16	C6HDYPO	0.07	0.13	**0.51**
17	H3VL	0.17	0.04	**0.33**
18	HXNQDS2	-0.04	0.24	**0.43**
19	QAHK	-0.06	0.44	**0.48**
20	QDHTKZN	0.12	0.14	**0.39**
21	8PKFHHV	0.36	0.28	**0.42**
22	B8G3Q4TO	-0.01	0.28	0.32
23	PJW25	0.10	0.55	0.56
24	S5EBI	-0.23	-0.11	0.18
25	VV45E	-0.13	0.09	0.30

Note. The numbers in bold are those that belong to their corresponding factor.

To protect the identity of the participants in this study, we only showed their assigned codes (pseudonyms). Data presented in Table 6 indicates that 4 participants belong to Factor 1, 6 to Factor 2, and 11 to Factor 3. Based on the centroid extraction method paired with varimax rotation, 4 participants (22-25) were unflagged, meaning they did not align closely with any identified factors during this analysis. They are referred to as non-loaders given, they are unrelated to any of the three factors and did not meet the rigor of commonality based on the expectations of factor analysis.

Table 7.

Z-Scores by Factors.

#	Statement	Factor 1	Factor 2	Factor 3
1	Design thinking, if learned well, can be the most practical way of applying what is learned in each course because it immerses you in societal problems.	1.11069	1.15771	0.52253†
2	Design Thinking makes Philosophy fun and challenging at the same time.	0.58080	-0.80903†	0.64920
3	Design Thinking is overwhelming, pressuring, and challenging.	-0.42788	-0.63407	-1.52794†
4	Applying such critical and creative thinking through design thinking can genuinely become a life-long learning experience.	0.41958†	1.25955	1.16243
5	Design thinking uses critical and creative thinking to select an innovative project that can benefit most people by providing a real-life alternative or solution to a specific problem.	1.51487*	**1.93068**	1.28646
6	Philosophy made us become productive students, and I got a glimpse of the creative potential I never knew I had.	0.03059*	0.05690*	-0.31593*
7	Design Thinking made me think outside the box-that's what Philosophy is all about.	1.00038	0.25295	0.54121*†
8	Doing Design Thinking in Philosophy shows our innovative ideas.	-2.16911†	0.21806	-0.01867

Note: The bolded Z-score represents the highest score per factor. Z-scores with this symbol * indicates the consensus statements, and those with this symbol † indicates the distinguishing statements per factor.

#	Statement	Factor 1	Factor 2	Factor 3
9	Design Thinking allows you to come up with fresh ideas.	0.23181*	0.26788*	0.05582*
10	Design thinking invites me to step out of my comfort zone.	-1.07725†	0.47538	0.36119
11	Design thinking is a game changer as it makes learning effective.	-0.85033	0.17180†	-0.72338
12	It made me realize that people are important when you make decisions – like what project to carry out – because they will be affected by it too.	0.66795	0.46252	**1.93314**
13	It is difficult to innovate when you do not know the problem of people who need help because design thinking should be about helping people.	1.30963	-1.10305†	0.74672
14	Design Thinking motivated and engaged me to learn in PHILOSOPHY as it allowed me to express myself.	-1.03097†	0.13219†	0.63071†
15	Design Thinking expresses my personal experiences, struggles, hobbies, and advocacy I am passionate about.	0.65024	-0.25850†	1.02919
16	It was hard at first to find a project of your own that could benefit other people.	-0.01116*	-0.62635	-0.00128
17	Design Thinking offers a different twist to usual projects.	-0.05316	-0.42693*	-0.63412
18	Design Thinking is an effective online learning modality since the pandemic has challenged the way that teachers teach their lessons and the way students learn.	-0.04401	1.21914†	0.37857

Note: The bolded Z-score represents the highest score per factor. Z-scores with this symbol * indicates the consensus statements, and those with this symbol † indicates the distinguishing statements per factor.

#	Statement	Factor 1	Factor 2	Factor 3
19	Since we are now living in a digital world, Design Thinking is something we need to adapt to global academic changes.	-1.40539†	0.92753	0.46533
20	If higher education is to face demands for digital change, design thinking is a powerful tool for innovation in networked, global learning.	0.56937*	-0.04169	0.99592
21	It would be more helpful if design thinking is done face-to-face.	-1.13500	-1.33161	-0.29175†
22	I cannot make sense of design thinking because I am not a techie; I'm lost in the digital world.	-1.95903*	-2.17652*	-2.14687*
23	Design thinking is not my cup of tea; it takes a while for me to become familiar with it.	-1.42825	-2.10454	-1.85498*
24	I need a little encouragement and motivation to translate my ideas into a design.	0.59309†	-1.31669†	-0.12965†
25	Design thinking helps me to think like a designer who can deal with difficult situations and solve complex problems in life.	0.06319†	1.12877†	-1.32113†
26	Design thinking, particularly prototyping, made us act like expert inventors.	-0.60937	0.09795†	-1.11572
27	Design Thinking is really helpful and significant in solving a societal problem.	1.32393*	1.68221	0.96841

Note: The bolded Z-score represents the highest score per factor. Z-scores with this symbol * indicates the consensus statements, and those with this symbol † indicates the distinguishing statements per factor.

#	Statement	Factor 1	Factor 2	Factor 3
28	Design thinking allows you to revise your ideas many times to come up with a better solution.	0.47389	0.14749	-0.63371†
29	Students are given a platform to introduce their creative skills to improve the lives of the people who would benefit from the project.	-0.26124†	1.13809	1.56664
30	Design Thinking builds self-confidence because it gives me the courage to believe in my creativity and put the ideas into reality.	**1.60575†**	0.44290	0.12061
31	Philosophy, while a difficult course, is made relevant and meaningful because of design thinking.	1.08700†	-0.35450	-0.06361
32	Design thinking should also be applied in other courses aside from Philosophy.	-0.95865	0.03476	-0.42334*
33	Design thinking allowed the students' voices to be heard and their innovative ideas to matter.	0.89434	0.09914†	0.68427
34	Design thinking sums up all our learning in Philosophy class.	0.78915	0.37602	-0.35296†
35	Designing a project in Philosophy is easy peasy.	-0.64396†	-1.84635	-2.1227
36	I would love to enroll in another course that uses Design Thinking.	-0.85146*	-0.64980*	-0.4206*

Note: The bolded Z-score represents the highest score per factor. Z-scores with this symbol * indicates the consensus statements, and those with this symbol † indicates the distinguishing statements per factor.

Z-scores generated for each factor (Table 7) indicate the position of each statement, the Q-set, in the quasi-normal distribution. Technically, the Z-score indicates the number of standard deviations the rating for a particular statement is above (if positive) or below (if negative) the mean (zero). Hence, statement 8 with a Z-score of -2.16911, for example, is two standard deviations below the midpoint of the distribution. Examining the table by column shows statements that characterize a specific factor. In the third column, for example, notice that Factor 1 ranked statement #30 the highest, while in the fourth column, Factor 2 ranked statement #5 as its highest. In the fifth column, it is statement #12 that was ranked the highest by Factor 3. Exploring the table by row displays the comparative score of a specific item across all factors. Factor 1 ranked statement #13 the highest, followed by Factor 3 and then last by Factor 2. In Q-methodology, the Z-scores, consensus statements, and distinguishing statements serve different purposes in understanding the factor analysis results.

Z-Scores

Z-scores reveal how many standard deviations the data point is from the mean. A positive Z-score means the data point is above the mean, while a negative Z-score is below the mean. Z-scores are calculated based on the consistency of individual rankings within a factor. The statement with the highest Z-score is the one that is consistently ranked highly by participants within that factor. Still, it may not necessarily have received the highest average ranking; it only Z reflects the degree of agreement within the factor.

Consensus Statements

Consensus statements are those statements within a factor that receive relatively high rankings or scores from most participants within that specific factor. They represent the overall average preference widely shared and agreed upon by participants within a particular factor. These statements reflect what most individuals in that factor believe or prioritize (Rahma et al., 2020). The highest-ranked statement in the consensus statement is the one that, when considering all participants in the factor, was collectively ranked the highest and rated the most favorable. It is determined by averaging the rankings of all participants within the factor. However, by itself, it may not reflect the degree of agreement or consistency across all participants.

Distinguishing Statements

The distinguishing statement represents the distinctive viewpoints or opinions that set a subgroup of participants within that factor apart from the other factors. It is essential to do so because it highlights what makes one factor distinct from another. The distinguishing statement contributes to the viewpoint

narrative of the factor by showcasing a key area of disagreement or differentiation between factors (Rahma et al., 2020).

To build a comprehensive viewpoint narrative for a factor, it is crucial to consider consistency (highest Z-core), the overall average preference (consensus statement), and the overall distinctive feature (distinguishing statement). Z-scores display a consistency that reveals the collective viewpoint shared within the factor, while the consensus statement illustrates the general inclination of participants or *most like how they think.* Further, the distinguishing statement highlights what differentiates the factor from others, offering valuable context to grasp its distinctive perspective. These elements work together to provide a well-rounded understanding of the factor's viewpoint.

Discussion

Factors Generated

After careful reference to the overall statement configuration, and in conjunction with the participant's demographic information, three factors emerged from this study. We assigned a name to each factor reflective of the distinctive viewpoints or perspectives expressed by the participants within that factor.

Factor 1: Groundswell Bootstrap Designers

Factor 1 was named the Groundswell Bootstrap Designers because it captures the collective momentum conveyed by *groundswell* and the proactive, self-sustaining approach implied by "Bootstrap." Factor 1 includes participants who recognize the proficiency of DT in boosting self-confidence, and deem it highly relevant to their academic journey. Factor 1 was a group of all male members representing 16% of the sample, and with a prominent background in design. This group includes students from various undergraduate levels, including freshmen, sophomores, and juniors.

Key statements that strongly resonate with the Factor 1 perspective include statement 30 (highest Z-score), emphasizing how DT bolsters self-confidence, and statement 31 (distinguishing statements), highlighting the alignment of DT with course difficulty. Conversely, Factor 1 showed the lowest agreement with statement 8, indicating that they do not require additional motivation, and statement 19, suggesting they may not yet feel prepared for design-related engagement. Regarding consensus statements, Factor 1 places the highest score on statement 5, underscoring the role of DT in enhancing creative and critical thinking. Conversely, they assign the lowest score to statement 22, indicating they do not view themselves as technologically challenged. Despite initial reservations, they express enthusiasm for further exploration of DT, believing in its capacity to enhance creative and critical thinking skills, all while dispelling the notion of being non-tech-savvy in the digital era.

Factor 2: Prolegomenal Design Thinkers

Factor 2, named Prolegomenal Design Thinkers, comprises six members, representing 24% of the participant sample. This group includes four males and two females, all first-year students. While half of the group has some experience in design-related activities, they are all relatively new to DT, hence the term *prolegomenal*. Ten statements distinguished this factor from other factors. Factor 2 agreed with statements 18 and 25, which were the two highest distinguishing statements. Conversely, they disagreed the most with statements 24 and 13, which ranked the lowest and second-lowest, respectively. The low ranking of statement 24 suggests that this group did not require additional motivation; they were inherently motivated. Furthermore, the fact that statement 13 also had a low rank demonstrates that they found innovation less challenging when driven by a desire to assist others through DT.

In addition, this group assigned the highest consensus score to statement 9, implying a surge of innovative ideas suitable for solving real-world problems. Their enthusiasm for creativity was evident, as they showed eagerness to explore new avenues. Interestingly, they were also less likely to perceive themselves as non-tech-savvy, as indicated by their lowest consensus score on statement 22. Moreover, statement 5 had the highest Z-score, emphasizing that this group highly values the enhancement of creative and critical thinking skills through DT.

Factor 2 is a group of individuals who are self-driven, innovative, and collectively experiencing a surge of creative energy or ideas. They are seen as resourceful designers capable of starting things independently. The members exhibit a forward-thinking mindset, a readiness to adapt, and a passion for innovation. They represent a promising segment of students eager to use DT to address contemporary challenges.

Factor 3: Non-Designer Humanitarians

Factor 3, named Non-Designer Humanitarians, is the largest group, comprised of 11 members, representing 44% of the participant sample. This group is predominantly male (60% males, 40% females) and most notably, 70% of its members are non-designers pursuing non-design-related degrees. These participants emphasize human-centered values and a strong sense of altruism in their approach to DT. Factor 3 resonated most strongly with statements 12 and 14 (highest distinguishing statements), indicating that the essence of DT lies in its potential to prioritize people. Statement 12 reflected their belief in considering the impact of their projects on others. Statement 14 underscored their view of DT as a platform for self-expression in the service of others. Conversely, statements 25 and 3 received the least agreement from Factor 3, suggesting that they did not find DT overwhelming, pressuring, or

challenging. These participants view themselves as capable problem-solvers, with DT as a means to realize their creative potential.

Factor 3 assigned the highest consensus statement score to statement 7, indicating a shared belief among these participants that DT serves its purpose by helping students understand how their design projects can make a meaningful humanitarian impact on people's lives. They see DT as a powerful tool for addressing societal issues effectively. On the other hand, statement 22 received the lowest score. This reflects a departure from the belief that they are non-technical people. In contrast to Factors 1 and 2, these participants are eager to step out of their comfort zones and explore novel approaches, demonstrating a willingness to embrace technology and innovation.

The highest Z-score in Factor 3 is statement 12, emphasizing that DT prioritizes people's well-being and considers their needs and perspectives when making decisions or creating solutions. They view DT as a people-centric approach, driven by a strong desire to make a positive difference in the lives of others. They are confident in their abilities, view DT as a valuable means of self-expression, and are enthusiastic about embracing new challenges, including technology.

Despite not meeting the initial criteria, Factor 4 has been included in our analysis, as it offers valuable insights that might have been overlooked in our examination of the perspectives that students hold toward DT. While this group is unflagged, their input has proven meaningful and should not be disregarded.

Factor 4: Recalcitrant Colliders

Factor 4 has 4 members representing 16% of the P-set. These members are non-loaders, that is, they do not strongly align with any factor or are not tied to any particular factor; in fact, they were unflagged. This group does not meet the requirements of commonality based on the assumptions of factor analysis. Factor 4 is a class of its own; hence, the *recalcitrant*.

We wanted to know why this group was unflagged. We then emailed them and asked them further questions to verify our interpretation of their group and better understand their Q-sort profile. Based on their answers, Factor 4 participants are not digital savvy (as Factor 1 is) nor prolegomenal to the digital world (as Factor 2 is). While they may want to be people-centric (as Factor 3 is), they are a little less of the three factors and more of confounders (individuals whose Q-sorts do not clearly represent a single viewpoint or factor). Mostly unfamiliar with designing and gaming, Factor 4 participants seemed to enjoy this unfolding of their talent and creativity in their Philosophy class with enjoyment and excitement. Adding Factor 4, though unflagged, allowed us to capture what could have been missed in examining the perspectives that students hold toward DT. Though recalcitrant as non-loaders, their perspective added something significant. Hence, their opinions cannot be ignored.

Student Views on Design Thinking

Through factor analysis our research uncovered three distinct participant groups, each offering unique perspectives on DT. Groundswell Bootstrap Designers exhibit a strongly positive attitude and possess significant DT experience. Prolegomenal Design Thinkers, though novices to DT, display an innovative outlook, while Non-Designer Humanitarians prioritize human-centric values. These factors provide valuable insights into the diverse student viewpoints, offering guidance for integrating DT in higher education.

An interview protocol was employed to ensure alignment between the interpretative and quantitative results. Findings revealed that statement 5 had consensus among all factors, indicating that all participants value creative and critical thinking and that DT enables innovative problem-solving. The perception common among participants across all factors is that DT is challenging yet human-centered and other-focused. Statement 22 was the least agreed upon among participants across all factors, indicating that regardless of their background or course, they agree that DT does not require high-tech expertise. While recognizing its challenges and complexities, they remain enthusiastic about the potential of DT. Whether they are seasoned designers, first-year students, or pursuing non-design-related degrees, they share a common interest in using DT to drive innovation and creative problem-solving. This approach appeals to their desire to positively impact society, express their creativity, and build self-confidence.

Design Thinking as the Future of Digital Learning

This study indicates that some students recognize Design Thinking (DT) as a potential direction for the future of digital learning. Such students will play a crucial role in shaping the future of digital learning, and their voices should be heard. By embracing innovative pedagogies, educators can cater to diverse learning needs and more effectively engage students in the learning process. Table 8 presents suggestions for each factor that educators should consider when preparing instruction that incorporates DT.

Table 8

Factors' Valued Aspects of Design Thinking and Enhancement Needs

Factors	Valued Aspect of Design Thinking	Enhancement Needs
Factor 1: Groundswell Bootstrap Designers	They find DT to be a source of enjoyment and intellectual challenge, making their learning experience both fun and stimulating. Members of this group see DT as a practical way to immerse them in addressing real societal problems. DT aligns with the rigor of Philosophy, where thinking beyond conventional boundaries is valued.	Incorporate more DT exercises, case studies, or projects where students can apply their creativity to philosophical challenges. Provide opportunities for students to engage in collaborative, real-world problems. Provide a platform for students to apply DT principles to various issues.
Factor 2: Prolegomenal Design Thinkers	They are DT enthusiasts with keen interest and possibly prior experience in design-related activities. They exhibit a resourceful and self- reliant attitude, bootstrapping their way up to create innovative solutions. Their thoughts are disruptive and forward-thinking. They have a wealth of creative and innovative concepts that they are eager to explore and develop.	Use various teaching strategies to provide for differentiation among learners. Promote cross-disciplinary collaboration, allowing students to work with peers from diverse fields to tackle complex problems. Organize exhibitions, showcases, or demo days where these students can present their projects and innovations to a wider audience.

Note: This table provides information about what each factor values in Design Thinking and the areas where enhancement is needed.

Factors	Valued Aspect of Design Thinking	Enhancement Needs
Factor 3: Non-Design Humanitarian	They value the human aspect of DT the most and consider the needs and experiences of people when making decisions and designing projects. For them, DT is a platform for self- expression of their creative potential.	Provide opportunities for skill- building and confidence-building in DT, such as workshops, mentoring, and peer support. Emphasize how DT can lead to tangible, real-world impacts and how their projects can benefit people. Create a supportive learning environment where students are encouraged to express themselves.
Factor 4: Recalcitrant Colliders	They simply want to enjoy DT for the sake of doing it.	Encourage them to know the value of DT by making them more engaged in real-world problems.

Note: This table provides information about what each factor values in Design Thinking and the areas where enhancement is needed.

Implications for Higher Education

This research evidences how DT can improve online learning experiences for students in a post-pandemic world (Bhandari, 2022; Ericson, 2022; Joachim et al., 2022; Ladachart et al., 2022). Findings revealed that DT can empower students to learn in a human-centered and creative way, making it a valuable tool for effective curriculum design and instructional delivery. Integrated as a pedagogical strategy, DT enhances students' creative thinking, problem-solving, and empathy (Adeyemi, 2012; Angheloiu et al., 2020; Ejsing-Duun & Skovbjerg, 2019; Ericson, 2022; Jamal et al., 2021; Joachim et al., 2022), ensuring a holistic learning approach in the digital future. Moreover, the study provides insights for administrators, educators, and decision-makers who wish to incorporate DT into policymaking, technology integration, and curriculum design beyond the pandemic. Results from this study present strong implications for future research on DT in higher education and demonstrates great promise for DT in the future of digital learning.

Conclusions

Our research primarily sought to uncover the viewpoints and experiences of students as they relate to DT, shedding light on how they perceive its relevance and impact in their learning journey. During the COVID-19 pandemic and the resulting quarantine measures imposed by the Philippine government in March 2020, there was a significant shift in the modes and platforms for delivery of instruction. At that time through necessity, delivery of university courses transitioned to a fully online format to accommodate remote learning. Our research considered this transition as part of the broader context in which students engaged with DT within the Philosophy course. The integration of DT into Philosophy courses, especially during the quarantine period, positioned students to recognize the transformative potential of this approach in addressing societal problems and finding innovative solutions. It became a valuable tool for them to navigate the uncertainties of the pandemic and contribute meaningfully to problem-solving efforts.

Given the research findings, Higher Education Institutes (HEI) should recognize the need to adapt to digitalization or risk falling behind. Integrating DT into college course designs has a clear potential for enhancing student learning. Three factors support this: 1) DT empowers students to be creative and critical in leveraging new technologies, 2) DT enhances design thinking skills, and 3) DT is human-centered. To optimize the use of DT in higher education, (1) teachers should adapt to students' views on DT and use effective teaching strategies to support their learning; (2) administrators should promote awareness of the future of digital learning, and (3) teachers should enhance their skills to integrate 21st-century skills.

Based on statistical data analysis and qualitative interpretation, students in this study perceive DT in three ways: empowering creativity and confidence

(Factor 1), enhancing latent design thinking skills (Factor 2), and encouraging people-centered missions (Factor 3). DT helps students discover their design skills and fosters empathy. As such, DT is recognized as an innovative tool for making Philosophy relevant even post-pandemic. The interpretative process involved in this study considered multiple interpretations of the data, prioritizing fidelity to participants' qualitative inputs. Statement configuration, demographic information, and participant inputs contributed to a comprehensive understanding of shared viewpoints, resulting in a balanced interpretation.

Recommendations

Given the results of this study, we make the following recommendations. *First*, to ensure meaningful learning, we suggest making DT mainstream rather than peripheral in response to the call for digital transformation in the 21st century. By incorporating it into mainstream practices allows for harnessing its benefits to drive innovation, create user-centered digital solutions, and effectively respond to the demands of the 21st century digital transformations. Moreover, it is recommended that DT be applied in other courses, with the provision that, based on the results of this study, instructional designers take into consideration the differing student viewpoints about DT. *Second*, we suggest future research conducted to corroborate our findings through experimental or correlational studies that will provide further evidence the positive effects from the application of DT in pure online learning vs. in-person or hybrid modalities. *Third,* we recommend exploring opportunities for follow-up studies that specifically focus on validating the identified factors. Independent validation would involve conducting research in different educational contexts and with diverse student populations to confirm the presence and characteristics of these factors. This process would contribute to the reliability and applicability of our typology beyond the scope of this study. *Lastly,* as part of the DT approach, it is important to include faculty professional development programs to support the upskilling of DT professors who will teach the subject and who will respond effectively in equipping students with the necessary skills they need for using DT to promote learning.

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Ethics Approval

This study was conducted after obtaining approval from the Institutional Review Board of Benilde-ARRC with Certificate Reference # 11162022-BxG-001 and Project Code BxG-07302022-C-10152022.

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