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Contextualising Design Thinking in South African High Schools: The D+NQ Model for Empowering Design Education

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Abstract

Design Education teachers in South Africa face persistent challenges in effectively teaching the design process within the Further Education and Training (FET) Band (Grades 10–12). These challenges include limited pedagogical resources, conceptual misunderstandings of design thinking, and difficulties in translating curriculum expectations into practical, learner-centred classroom activities. This study develops the Van Deventer D+NQ Model to support teachers in addressing these challenges and improving the teaching of design thinking in schools. The study is informed by Design Thinking as a conceptual framework and Self-Determination Theory, which explains how learner motivation, autonomy, and engagement are enhanced through meaningful and structured learning experiences. A qualitative research design was adopted, using interviews, classroom observations, and document analysis to explore teachers' experiences and interpretations of the design process. Participants were selected from Design Education classrooms, and data were analysed thematically to identify patterns in teaching practices and curriculum implementation. Ethical clearance was obtained, and informed consent was secured from all participants to ensure confidentiality and voluntary participation. The findings indicate that many teachers struggle with uncertainty in interpreting curriculum requirements and often rely on traditional, content-heavy approaches that limit creativity and learner engagement. The D+NQ Model was found to provide a clear, structured, and flexible framework that supports teachers in guiding learners through key stages of design thinking, including empathy, ideation, prototyping, and reflection. It also enhances learner participation, creativity, and confidence. The study concludes that the D+NQ Model bridges the gap between curriculum theory and classroom practice, offering a practical tool for improving Design Education in diverse, resource-constrained learning environments while promoting an innovative, learner-centred pedagogy.

Keywords: Design education; curriculum development; design thinking; educational design research, design process, D+NQ Model

Introduction

It is prudent to foreground this study by noting that Design Thinking (DT) is a transformative approach that has gained traction in diverse fields, including business, engineering, technology, and, most notably, education. Design Thinking is conceptualised as equivalent to the design process. In this article, the term is used interchangeably. No longer confined to the realm of professional design, DT has evolved into a human-centred methodology that promotes innovation, creativity, and problem-solving. Defined by its empathetic and iterative approach, DT fosters collaboration and critical inquiry, making it highly relevant in 21st-century learning environments (Thiba, Razwinani & Motaung, 2025; Van Deventer, 2021). According to Van Deventer (2021), a strong and equitable education system is the foundation of a prosperous and innovative society. In South Africa, despite numerous interventions by the state and non-state stakeholders, challenges related to access, quality, and equity in education persist (Cassim, 2013; Clercq, 2020; Van Deventer, 2021). Hence, particularly troubling is the gap in learning

outcomes between well-resourced urban schools and under-resourced rural ones, underscoring the urgent need for scalable, innovative solutions that empower learners across the socioeconomic spectrum.

In recent years, digital technologies and experiential learning tools have become increasingly prominent in transforming education (Clercq, 2020). Among these, the concept of DT stands out for its potential to shift learning from a passive to an active, learner-driven experience. Scholars like Maneewan, Hemtasin, and Thongsuk (2024) emphasise that by focusing on real-world problem-solving, DT cultivates essential skills such as critical thinking, collaboration, and creativity, all of which are crucial for success in the contemporary workplace landscape. Therefore, the Van Deventer D+NQ Model (the full designation, hereafter referred to as the D+NQ Model builds on this foundation by offering a flexible, practical design thinking framework tailored for South African learners. Whether implemented in classrooms or extracurricular settings, the model is designed to bridge the gaps between abstract knowledge and practical application, helping learners develop confidence, competence, and a deeper understanding of their educational journey.

Furthermore, the academic discourse on DT has evolved significantly over the past three decades (Cassim, 2013; Clercq, 2020; Thiba et al., 2025; Van Deventer, 2021). Initially focused on understanding the mental processes of professional designers, learners have increasingly explored how DT can be utilised by individuals without formal design training. This evolution has sparked the development of new methodologies, including simplified design practices that make DT accessible to broader audiences (Clercq, 2020; Johansson-Sköldberg, Woodilla & Çetinkaya, 2013; Van Deventer & Steyn, 2022). Johansson-Sköldberg et al. (2013) draw a useful distinction between "designerly thinking", which refers to the theoretical foundation embedded in professional design practice, and "design thinking", which refers to the adapted methods accessible to non-designers. This distinction is essential for understanding how DT is integrated into fields such as education.

In the South African context, the Department of Basic Education (DBE) has taken steps to incorporate DT into the Further Education and Training (FET) Design curriculum for Grades 10 to 12. The Design curriculum was introduced in 2012 to integrate theory, practical application, and research with the goal of nurturing creativity, entrepreneurship, and innovation among learners (Van Deventer & Steyn, 2022). Lor (2017) stresses the educational potential of DT by describing it as a mindset and collaborative process that emphasises human needs. The value of DT in education lies in its ability to encourage divergent thinking, iterative learning, and interdisciplinary collaboration. Saal, Chetty, Ntshayintshayi, Moosa and Masuku (2025) and Van Deventer (2021) also highlight the growing focus on integrating technology and design in educational spaces, advocating for models that merge digital tools with hands-on learning.

Despite, the promising advances in DT integration, significant gaps remain. Firstly, since many DT approaches are developed in high-resource environments, they may not translate effectively to under-resourced schools in South Africa. Secondly, the uneven rollout of teacher training and support mechanisms hinders the widespread implementation of DT strategies. Teachers, who are key agents in this process, often lack the skills and confidence to adopt and adapt design methodologies to their pedagogical practices (Van Deventer & Steyn, 2022). Furthermore, another gap exists in the practical application of DT in basic education. Although DT is discussed at the policy and curriculum levels, few tools have been designed specifically to cater to the diverse needs of all South African learners, including the relevance of their country's history. There is a pressing need for a model that is adaptable, inclusive, and accessible to learners of varying backgrounds and levels of academic preparedness. This is the space in which the D+NQ Model operates.

This article is motivated by the urgent need to introduce a contextually relevant and adaptable educational tool that addresses the challenges faced by South African learners. The D+NQ Model was developed as part of a doctoral study aimed at reimagining how learners engage

with complex problems through design thinking in the design process. Hence, rooted in empathy and real-world problem-solving, the model offers learners an inclusive pathway to develop future-ready skills. What makes the D+NQ Model unique is its focus on experiential, hands-on learning. The model guides learners through the design process of identifying a problem, brainstorming solutions, creating prototypes, testing ideas, and iterating based on feedback. This iterative loop fosters resilience, adaptability, and deep learning. By putting learners at the centre of the process, the model aligns with constructivist theories of education and supports the development of agency and self-efficacy. Another key strength of the D+NQ Model is its scalability and flexibility. It is designed to accommodate varying levels of technological access and pedagogical styles, making it suitable for both urban and rural schools. Furthermore, it is not limited to classroom use, as it can be implemented in after-school programmes, innovation and entrepreneurial clubs, and community-based learning projects.

Ultimately, this article engages key educational stakeholders, including teachers, school administrators, policymakers, and curriculum designers, by outlining the core features of the D+NQ Model and demonstrating its potential to transform educational practice in South Africa. This article aims to answer two central questions

(1) What is the D+NQ Model?

(2) What are its key characteristics?

By answering these questions, the article not only contributes to the growing body of literature on DT in education but also offers practical insights for enhancing teaching and learning practices across diverse educational contexts.

Theoretical framework

The theoretical foundation of this study is Self-Determination Theory (SDT), developed by Ryan and Deci (2000), who posit that human motivation is driven by the fulfilment of three innate psychological needs: autonomy, competence, and relatedness. 1) Autonomy refers to the individual's need to feel in control of their actions and choices. 2) Competence involves the desire to feel effective and capable in interacting with the environment. 3) Relatedness pertains to the human need for social connection and meaningful relationships with others (Ryan & Deci, 2000; Regudon, Yazon, Manaig, Sapin, & Tamban, 2022). Therefore, these principles are particularly relevant in educational contexts where intrinsic motivation is essential to meaningful learning. Figure 1 below visually represents the theoretical framework of Self-Determination Theory (SDT).

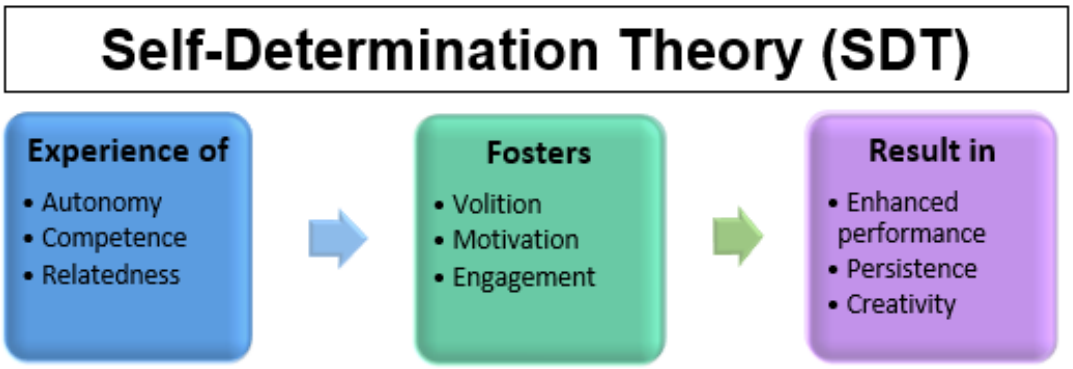


Figure 1: Self-Determination Theory (SDT). Adapted from Richard M. Ryan and Edward L. Deci (2000).

With reference to the implementation of a new design thinking tool in schools, SDT offers valuable insights into how such an innovation can be effectively introduced and sustained (Shapira, Ketchie & Nehe, 2017). Therefore, to nurture their autonomy, learners should be allowed to explore

the tool creatively, make decisions and pursue ideas that reflect their personal interests and problem-solving styles (Ryan & Deci, 2000; Regudon et al., 2022). Importantly, teachers must provide appropriate scaffolding, feedback, and support to ensure that learners gradually develop the skills and confidence to use the tool effectively. Lastly, relatedness can be promoted through collaborative learning environments that encourage teamwork, shared inquiry, and mutual support. If these conditions are met, they create a classroom culture that is not only innovative but also emotionally and socially supportive, aligning with the principles of DT itself (Ryan & Deci, 2000; Regudon et al., 2022).

SDT was chosen because it aligns with DT. The characteristics of DT also support the cultivation of learner motivation, creativity, and resilience. Since DT encourages learners to accept ambiguity, they embrace uncertainty and incomplete knowledge as part of the process (Van Deventer, 2021). Furthermore, it values cross-disciplinary collaboration, in which individuals from diverse backgrounds and areas of expertise contribute to the creation of solutions. Therefore, by nature constructive, DT encourages the development of new ideas through iterative refinement and the recombination of existing knowledge. Potts (2022) is of the opinion that it rewards inquisitiveness, cultivates curiosity and encourages learners to approach familiar challenges with a fresh perspective.

Importantly, empathy is at the core of DT, as it emphasises understanding users' needs, emotions, and experiences. Design thinkers view the world through the eyes of the end user, designing solutions that are not only functional but also meaningful and impactful. Notably, a holistic approach is also essential, as the broader context of the user experience is considered throughout the design process (Ryan & Deci, 2000; Potts, 2022; Regudon et al., 2022). Furthermore, DT is iterative, meaning that ideas and solutions are continuously tested, evaluated, and improved. This cyclical process fosters resilience and adaptability, crucial traits in both education and innovation. For this reason, a non-judgmental stance is encouraged since ideas are explored freely without fear of failure or criticism. Additionally, an open mindset complements this constellation of traits, enabling DT to be applied across all sectors, disciplines, and problems, regardless of their scope and complexity (Beh, Pedell, & Mascitelli, 2018; Ryan & Deci, 2000; Potts, 2022).

In line with these core principles, successful design thinkers exhibit distinct attributes that underpin their effectiveness. Firstly, they prioritise individual user needs by constantly seeking feedback and adapting their designs accordingly. Secondly, they integrate experimentation into their process by embracing trial-and-error as a method to refine their ideas and solve problems. Moreover, their experimental mindset is complemented by strong communication skills, which enable them to share their insights clearly and persuasively (Beh et al., 2018; Ryan & Deci, 2000; Potts, 2022). Moreover, collaboration is another hallmark of DT practice. Furthermore, design thinkers are recognised for valuing diverse perspectives and leveraging collective intelligence to enhance their ideas. They thrive in complexity, bring clarity to multifaceted problems and develop actionable solutions.

Resilience and a positive mindset are essential components of the design thinker's way of working. In Design Thinking, setbacks and failures are not treated as endpoints but as valuable opportunities for reflection, refinement, and learning. Practitioners, therefore, approach problems with curiosity, openness, and optimism, continually seeking better and more user-centred solutions (Beh et al., 2018; Ryan & Deci, 2000; Potts, 2022). This mindset encourages persistence and adaptability, both of which are critical in complex and uncertain problem-solving environments.

In addition to resilience, design thinkers also demonstrate holistic thinking. This means they understand that problems do not exist in isolation but are embedded within broader social, cultural, and systemic contexts. As a result, effective solutions must account for the interconnected factors that shape user experiences. Familiarity with the Design Thinking process further strengthens this capability, as it equips practitioners to move purposefully through its key phases, empathising, defining, ideating,

prototyping, and testing, while maintaining clarity of intent and focus on user needs. It is important to clarify the positioning of Design Thinking (DT) within this study. DT is best understood as a conceptual framework or pedagogical approach, rather than a theoretical framework. It provides structured guidance for teaching, learning, and problem-solving, while also shaping instructional design and classroom practice. This distinction is important, as theoretical frameworks (such as Self-Determination Theory) explain underlying motivational principles, whereas DT guides their enactment in practice.

Collectively, these attributes and framework provide the foundation for introducing the D+NQ Model in South African schools. Integrating Self-Determination Theory ensures that learners' intrinsic motivation is supported, while Design Thinking as a conceptual and pedagogical framework empowers them to become creative problem-solvers, collaborative learners, and empathetic innovators. This integrated framework not only enriches the learning experience but also equips learners with the cognitive, emotional, and adaptive skills necessary for lifelong learning in an increasingly complex and changing world.

Research Methodology

This study adopted an interpretivist paradigm, which prioritises understanding social reality from the perspective of those experiencing it (Cohen, Manion & Morrison, 2011). Furthermore, Interpretivism claims that knowledge is socially constructed and context-dependent, making it ideal for qualitative enquiry into education. In this study, teachers were viewed not as neutral transmitters of curriculum content but as active agents whose pedagogical decisions were shaped by their social contexts, professional training, and available resources (Ohemeng-Appiah, 2014). These contextual factors, collectively referred to as teaching practices, are crucial in understanding how teachers engage with and interpret the Design Process outlined in the South African CAPS (Curriculum and Assessment Policy Statement, 2011) document. For this reason, the D+NQ Model emerged from the real challenges Grade 11 Design teachers faced as they tried to help learners navigate the CAPS Design Process. Teachers reported that learners often felt overwhelmed and uncertain about how to begin or progress through the abstract steps. The model was developed as a practical response, offering a clearer, more supportive pathway that structures learners' thinking, encourages deeper questioning, and guides meaningful design decisions. Ultimately, the D+NQ Model serves as both a teaching tool and a guide for learners, helping everyone approach the design journey with greater clarity and confidence.

Research design: A case study approach

The study employs a qualitative case study design, which is particularly appropriate when the aim is to explore a phenomenon in its real-life context and when the researcher has limited control over variables (Yin, 2012). According to Anderson and Arsenault (1998), case studies enable the researcher to examine complex interactions in natural settings and offer rich, detailed insights into behaviours, practices, and relationships. Therefore, this strategy was selected to allow an in-depth examination of the lived experiences of both teachers and learners as they engage with the Design curriculum in public high schools in South Africa.

Moreover, the case study does not seek to establish generalisable laws but focuses on gaining a sound understanding of a bounded system, in this case, Design education in the Gauteng Province. Considering the views of Cohen et al. (2011), the original doctoral research (Van Deventer, 2021) used a descriptive case study aimed to answer the following questions:

1. *How do teachers interpret the design process?*
2. *Why do they interpret it the way they do?*
3. *How does this interpretation affect their teaching practices?*

The answers to these questions are expected to make a practical and theoretical contribution to curriculum implementation and teacher development in Design education. These questions were answered in a doctoral study

conducted at the University of Pretoria (Van Deventer, 2021).

Context and site selection

The research was conducted in the Gauteng Province of South Africa, which was selected for practical, logistical, and contextual reasons. The researcher's proximity to the region and familiarity with the Gauteng Department of Education (GDE) facilitated access and ensured compliance with research protocols. Gauteng is a diverse and densely populated province with a substantial number of Design schools in the FET band. In South Africa, approximately 54 public high schools offer Design as a subject in high school.

A total of seven schools were purposively selected from five GDE districts: Tshwane South, Johannesburg North and South, Ekurhuleni North, and Ekurhuleni South. These schools were chosen as they vary in academic performance, geographical location and demographics. The inclusion of both high-performing and under-resourced schools ensured a broad understanding of how context shapes teachers' interpretations and implementations of the design process.

Sampling strategy

Purposeful sampling was employed to identify schools and participants who would provide rich, relevant information (Ahmad & Wilkins, 2025). The sample included eight Design teachers and 42 Grade 11 learners. Schools were initially selected based on their Grade 12 Design NSC performance from 2014 to 2018. Learners were categorised as high, average, and low performers to allow for analysis of differentiated experiences. A notable gender trend was observed and the predominance of female participants reflected broad gender patterns in the subject.

Data collection methods and instruments

Document Analysis

The CAPS Design Curriculum (DBE, 2011) and the 2018 PAT Guidelines (Practical Assessment Task) were analysed to establish a baseline understanding of the Department of Basic Education's expectations. These documents served as reference points for evaluating how teachers align their teaching with official requirements. According to Bowen (2009), document analysis helps to identify content patterns and discrepancies between policy and practice, making it an essential tool in this study.

Semi-Structured Interviews

Eight Design teachers participated in semi-structured interviews, conducted both online (via Zoom) and in person, depending on accessibility and COVID-19 constraints. This method not only allowed for flexibility but also ensured depth of engagement. As Creswell (2013) notes, semi-structured interviews are valuable in qualitative research because they balance consistency with the freedom to explore unexpected insights. Interview questions were aligned with the research questions and peer reviewed to ensure their validity.

Data analysis strategy

Data analysis followed an inductive qualitative framework (Thomas, 2006). After a manual content analysis (Braun & Clarke, 2006), the raw data from interviews and documents were coded to identify emergent themes. Open-coding techniques (Ahmad & Wilkins, 2025) were applied and intercoder reliability was ensured through collaboration with the research supervisor. The findings were then triangulated across all data sources to enhance their credibility and analytical depth.

Trustworthiness and Ethical considerations

The study followed established protocols to ensure credibility, dependability, confirmability, and transferability (Van Heerden, 2005). Ethical clearance was obtained from the relevant institutional ethics committee prior to data collection. All participants provided informed consent and were clearly informed about the purpose of the study, with assurance of confidentiality and voluntary participation (Patten & Newhart, 2018). To strengthen the trustworthiness of the findings, member checking was conducted to verify the accuracy of interpretations with participants. However, participation in this process was limited due to time constraints, which may have affected the extent of feedback received. Overall, these

procedures were implemented to ensure that the research adhered to ethical standards and maintained methodological rigour throughout the study.

Limitations and strengths

The relatively small sample size makes generalisation of the findings impossible. Additionally, the COVID-19 pandemic delayed data collection and caused several logistical challenges. Nevertheless, the insider knowledge of the researcher, who is a Design teacher, now an academic at a university, added depth and contextual sensitivity to the study, which originally formed part of a PhD study in Design education. Triangulation across multiple data sources mitigated the potential for bias and enhanced the study's trustworthiness.

Results

From the semi-structured interviews with Design teachers, three central themes emerged: cognitive, emotive, and empathetic. Each of them offers insights into how teachers perceive, experience, and implement the design process in the classroom. The three themes were structured to align with the Doctoral study's core research questions, offering a holistic understanding of Design pedagogy in the Further Education and Training (FET) phase in South Africa. They were developed as described below.

Cognitive theme: Thinking about the design process

Several Design teachers perceive the design process as non-linear and iterative, highlighting its flexibility and the dynamic nature of creative problem-solving. They emphasised that the process is not a rigid, step-by-step method but rather a fluid, evolving cycle. Learners are encouraged to revisit earlier stages, rethink initial ideas, and make continuous improvements. This reflective approach nurtures experimentation and supports the development of higher-order thinking skills. Participant RST1 asserted that *"It's definitely all over the place. I think as soon as you have a recipe for something, there is a problem."* This assertion illustrates the open-ended and organic nature of design thinking. Similarly, T5 emphasised that *"It teaches them a lot more going back and forth."* T6A and T6B referred to the process as *"iterative"* and T6B added that *"you move to the front and back, front and back."* These responses suggest that many teachers view the design process as cyclical and flexible, allowing learners to ideate, test, and refine their ideas.

In contrast, a subset of Design teachers had a more linear and structured interpretation of the process. They found value in predictable sequences and clear instructional progression. T2 remarked that *"It's easier to take the linear approach, and children like to know the sequence of what they have to do."* Echoing this sentiment, T3 simply commented, *"I'd go with linear."* T4 explained, *"I believe one thing needs to happen before the next can happen."* T7 supported the idea of a sequential logic process by stating, *"Step 1, 2, 3, 4, 5, that is the process."* Such responses indicate a preference for clarity and cognitive structure, especially with younger or less confident learners.

Both camps, iterative and linear, consistently viewed the Design brief as the critical starting point. Teachers described the process of moving from the brief through various stages to arrive at the final product. T4 explained it as *"Making phase steps and moving on to getting your final design before you start actually making the final design"*. T6A noted that *"First, you get the brief, then try and identify the key concepts"*. Likewise, T6B mentioned *"I follow the different steps for brainstorming to the solution",* and T7 stated that *"Stages you do until you apply and get the final colour"*. These perspectives reflect the idea that the brief serves as an anchor guiding learners through research, ideation, prototyping, and refinement.

Other participants framed the design process in terms of *developmental thinking and problem-solving*. RST1's remark, *"I make sure that we go through development"*, focused on growth and concept expansion. T2's comment, *"I would plan"*, stressed the importance of structured preparation. T3's view of the process as *"a problem that you have to order"* underlined the problem-solving ethos of Design education.

Collectively, the data reflect a *dual cognitive approach*: some teachers adopted a

structured, linear interpretation, while others adopted a fluid, reflective model. The linear model is perceived as cognitively manageable and consistent with traditional classroom setups. T4 underscored this view: *"You can't build the house just by starting at the walls."* This metaphor, used by Williams (2000), conveys how teachers use structure to scaffold learning in a tangible, systematic way.

On the other hand, teachers who favour the iterative method value the dynamic mental engagement it provides. Their approach supports a more exploratory and responsive teaching philosophy closely aligned with the learner's process of discovery. T6B, for instance, described the iterative workflow starting with the brief: *"You unpack the problem, research, brainstorm…"* which aligns with Gyabak (2015), Serekoane, Ochuot-Agumba & Janse van Vuuren's (2022) notion that meaningful learning emerges from a collaboration of cognitive processes.

The cognitive theme also reveals varying levels of curriculum familiarity. Some participants had a clear grasp of the CAPS and PAT documents and systematically aligned activities with the learning outcomes. These teachers confidently scaffold design tasks into manageable parts, including concept development, research, ideation, prototyping, and final product execution. Others, however, expressed confusion or pointed out blurred phases in the design process, indicating inconsistencies in how they implement curriculum guidance. This cognitive dimension uncovers both the strengths and the gaps in Design teachers' understanding. Whereas some are highly reflective practitioners who adapt and iterate, others rely on linear models to maintain order. This variation highlights the need for ongoing professional development to enable teachers to effectively blend iterative and structured methods.

Emotive theme: Feelings about Design teaching

Two teachers had emotional interpretations of the design process. In other words, their feelings shape their instructional choices and learner engagement. T1's comment *"That we don't just jump to a conclusion"* highlights that learners must progress thoughtfully and reflectively through each stage. T5 remarked, *"I feel you start with an idea, and then you look for influences in your own work"*, which suggests that design is not only a cognitive task but also an affective and introspective journey.

Hence, these reflections underscore a recurring theme in Design education, namely that the process involves more than solving problems; it is about experiencing them emotionally and personally. For these teachers, feelings such as curiosity, intuition, and even vulnerability are central to the creative act. Relatedly, as Stanko-Kaczmarek (2012) argues, learners' emotions significantly influence their willingness to engage creatively and persist through complex challenges. The emotional tone set by teachers, therefore, is a scaffold supporting not only knowledge acquisition but also emotional resilience and self-awareness.

The broader *emotive theme* focuses on how Design teachers feel about their subject, their learners, and the contextual realities of their teaching environments. Drawing on Tan and Jung's (2024) conceptualisation of emotion as emotional presence, the experience of emotion emerging from cognitive appraisals during learner-environment interactions, this construct is understood to comprise four dimensions: interest-curiosity, emotional regulation, expression management, and emotional awareness. The data reveal how these inner experiences influence pedagogical approaches. Participants shared emotional responses ranging from enthusiasm and joy to anxiety and exhaustion. For some, teaching Design is not just a position; it is a passion. These teachers often spoke about the subject as a calling. The mere fact that their learners think differently, express themselves, and develop unique creative identities is a source of great satisfaction (Thiba, Razwinani & Motaung, 2025; Van Deventer, 2021).

The more ambivalent or negative emotions of other teachers are often tied to systemic constraints such as inadequate access to materials, time constraints, limited curriculum flexibility, and assessment demands. Participants report that these stressors suppress creativity and lead to emotional fatigue. Despite these constraints, many teachers manage to nurture

learners' emotional intelligence through empathy, encouragement, and safe experimentation.

Ultimately, the emotive dimension of teaching Design shapes not only what teachers do in the classroom but also how they do it. Their emotions influence the classroom climate, learners' risk-taking behaviours, and the quality of creative engagement. By fostering emotionally aware learning environments, these teachers cultivate a design process that is both intellectually rigorous and deeply human.

Empathetic Theme: Understanding and Supporting Learners

Three Design teachers indicated that an empathetic framework was central to how they interpret and teach the design process. T5 explained that *"Very similar to how I try to motivate my kids to do it… not just copying something else… Don't live in isolation of the world you are living in."* Such a view emphasises the importance of cultural and contextual awareness in Design thinking. This teacher encourages learners to draw inspiration from their environment and personal experiences, rather than imitating existing designs. Learners who heed this advice adopt an authentic, socially engaged approach.

Similarly, T6B's assertion that *"It's affecting people"* reinforces the notion that design has tangible impacts on individuals and communities. For these teachers, empathy is not an abstract ideal but a pedagogical strategy that grounds learners in real-world thinking. They aim to nurture human-centred designer-learners who consider their end-users' needs, emotions, and circumstances before devising solutions. This approach reflects the principles of empathy-driven Design education advocated by IDEO (2017) and Brown (2009), emphasising the ethical, responsible, and relational aspects of design alongside functionality and aesthetics.

The empathetic theme, as conceptualised by Savina, Fulton and Beaton (2025), centres on teachers' ability to recognise, understand, and compassionately respond to their learners' emotions and circumstances. Within the classroom, such empathy translates into differentiated instruction, responsive feedback, and the nurturing of learner activity. Participants noted their attentiveness to learners' socio-economic contexts, academic needs, and emotional well-being. Especially teachers working in under-resourced environments adopted flexible timelines, used formative assessment more supportively, and tailored project briefs according to their learners' realities.

Empathy also influenced how teachers scaffolded the design process. They described their role as not only instructors but also facilitators of confidence-building and self-expression. For example, T5 noted that one learner's effective planning and layout led her to *"motivate other learners to do the same"*. In this instance, peer modelling was used as a compassionate and inclusive teaching tool. Such practices demonstrate how empathy can be embedded within both the content and the structure of a design curriculum.

In conclusion, the empathetic dimension of Design education helps learners see themselves as part of a broader society, one in which design can be a vehicle for change, understanding and inclusion. Teachers who adopt this approach do not merely teach design skills but raise emotionally intelligent and socially conscious citizens.

Discussion of Effectiveness and Functionality: The Van Deventer D+NQ Model

According to Van Deventer (2021), the D+NQ Model developed organically during her research. It was not the initial objective. It was conceptually inspired by insights drawn from the literature and a growing interest in alternative frameworks for thinking and problem-solving. The model evolved in response to both the theoretical underpinnings of design thinking and the observed challenges in South African classrooms, particularly those related to the CAPS Design curriculum.

The D+NQ Model (see Figure 2 below) is an iterative and flexible approach to problem-solving, central to design thinking. Unlike linear models, it allows for recursive movement between phases, promoting reflective practice and

adaptability (Van Deventer, 2021). A distinctive feature is the CRIT cards at the end of each stage. These reflective prompts serve as built-in checkpoints that encourage continuous self-assessment, peer evaluation and constructive critique, elements often missing in more product-driven pedagogies (Brown, 2008; Johansson-Sköldberg, Woodilla & Çetinkaya, 2013).

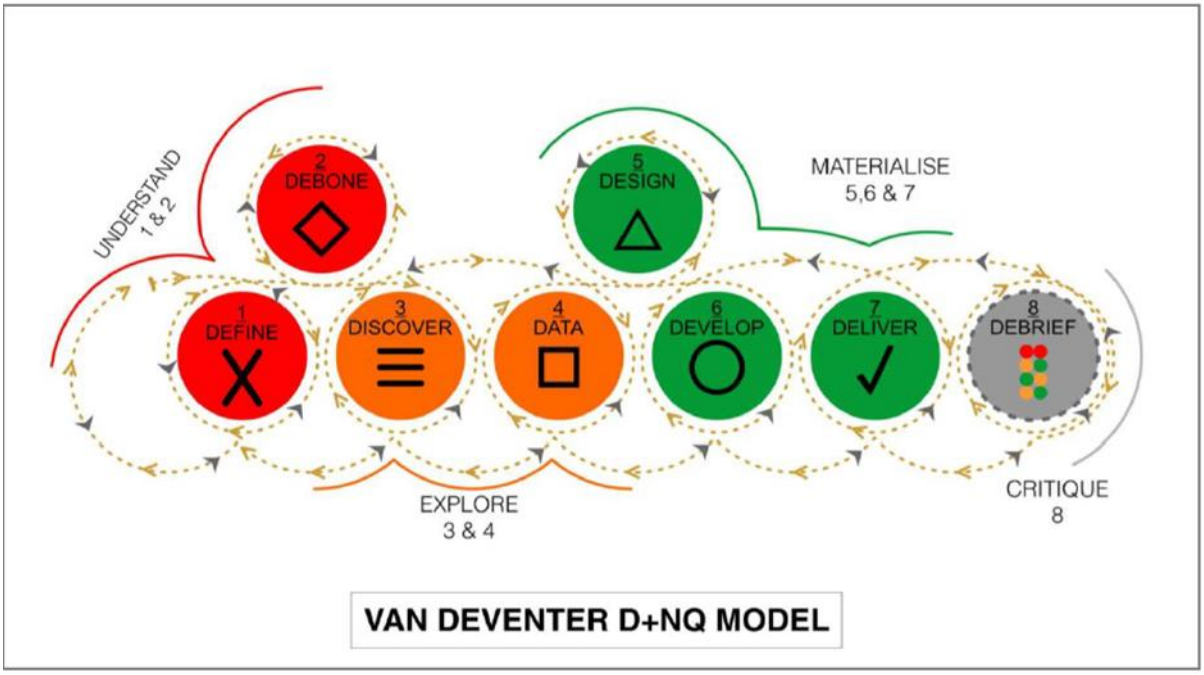


Figure 2: The Van Deventer D+NQ Model: The design process — 8 steps in transforming the existing way of solving problems. Adapted from Anriët van Deventer (2021).

The model's effectiveness was evident during the analysis of learner artefacts. Its stage-and-step structure provided a clear yet dynamic framework for interpreting learners' design journeys (Van Deventer, 2021). Each card enabled systematic tracking of their decisions, conceptual development, and iterative changes. This mirrors the principles articulated by the Hasso Plattner Institute of Design (d.school) and IDEO, which emphasise empathy, iteration, and reflection as core tenets of design thinking (IDEO, 2017). Figure 3: Product photographs | Van Deventer D+NQ Model provide a glimpse of the model's packaging.

Furthermore, the model's alignment with South Africa's curriculum policies strengthens its functionality. As illustrated in Figures 4.1 and 4.2, the D+NQ Model bridges the gap between theory and practice by linking to CAPS and PAT requirements. This alignment ensures that the model meets national educational goals on the one hand and allows for contextual flexibility on the other (DBE, 2011; Van Deventer & Steyn, 2022).

Discussion

This article argues that Design Thinking (DT), when effectively implemented through a contextually relevant model such as the D+NQ Model, offers powerful pedagogical tools fostering learner motivation, problem-solving, and creativity in South African schools. It also submits that Design teacher interpretations of the design process, whether linear or iterative, affect how learners experience the subject and develop essential 21st-century skills. Drawing on Self-Determination Theory (SDT), the findings highlight the importance of nurturing learners' autonomy, competence, and relatedness within the design process.



Figure 3: Product photographs | Van Deventer D+NQ Model. Adapted from Anriët van Deventer (2021). URL link to website: link: https://rb.gy/mebibz or scan QR code

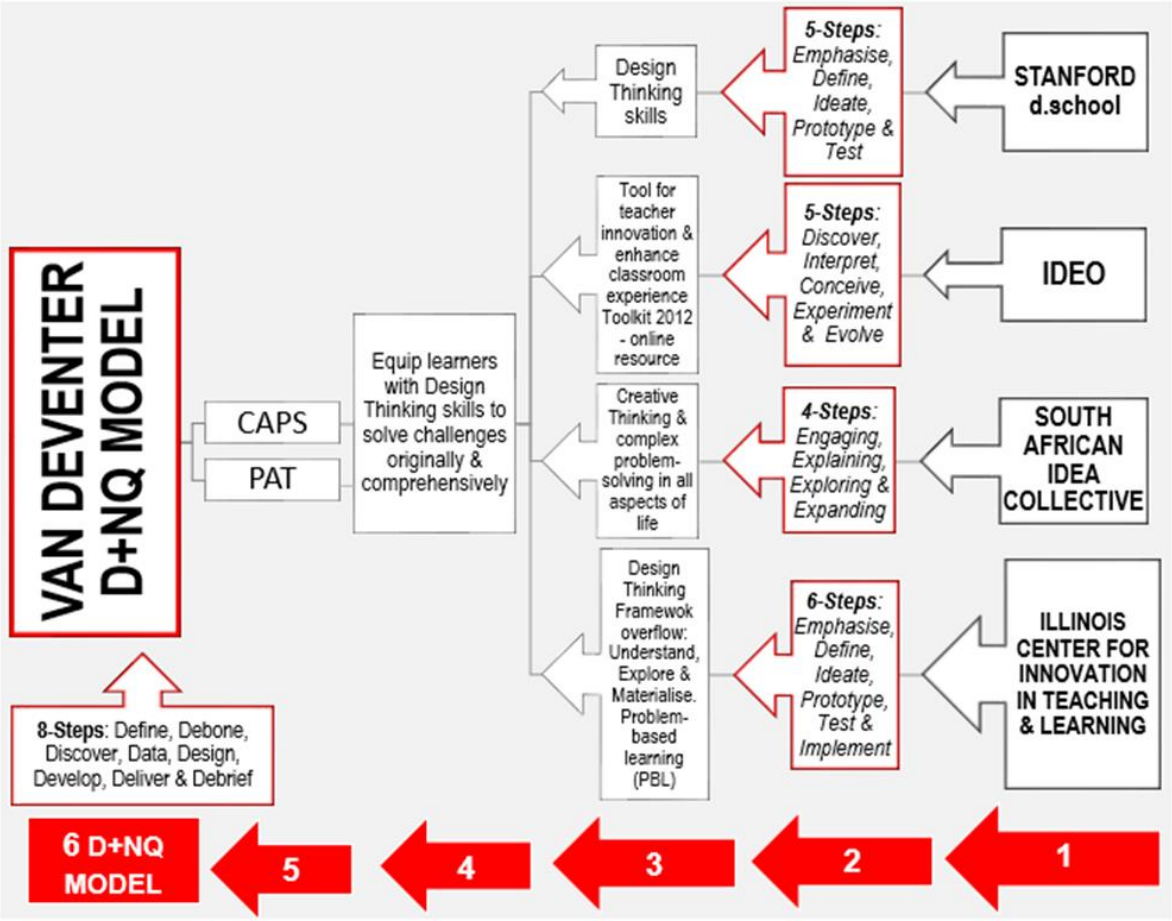


Figure 4.1: Organogram: The Van Deventer D+NQ Model links to CAPS, PAT and other Design Thinking theories. Adapted from Anriët van Deventer (2021).

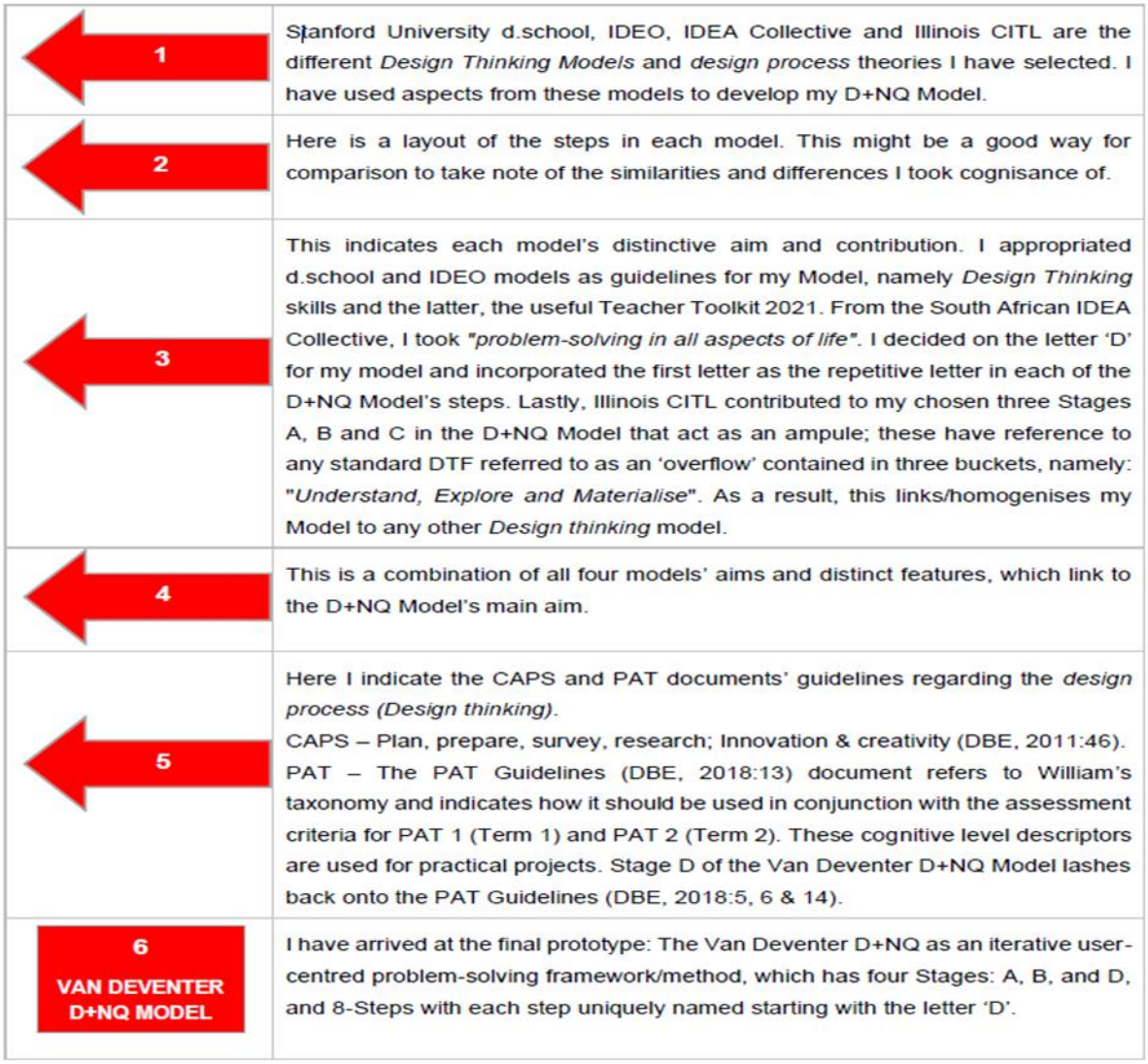


Figure 4.2: Organogram: Van Deventer D+NQ Model links to CAPS, PAT and other Design Thinking theories. Adapted from Anriët van Deventer (2021).

The findings of this article are that teachers hold differing conceptions of the design process. Some view it as a structured, step-by-step procedure (linear), while others see it as a flexible, evolving sequence (iterative). In line with previous research (Lawson, 2005; Xu & Wang, 2018), the current article's findings reveal a dual orientation among teachers. Evidently, each approach serves a different purpose; linear interpretations ensure structure and predictability, whereas iterative approaches foster experimentation, risk-taking, and reflective thinking. The findings show that effective teaching requires both approaches to meet learners' diverse needs. These findings align with the theoretical framework of this article, which suggests that learners are more intrinsically motivated when their need for autonomy and competence is acknowledged (Ryan & Deci, 2000; Regudon et al., 2022).

Scholars such as Williams (2000) have long argued that learners benefit from systematic instruction, especially when new or complex concepts are introduced. Their argument was echoed by participants who preferred a linear design process and believed that a step-by-step approach helps learners build foundational skills before moving to more complex tasks. The findings show that other teachers valued an open-ended, iterative model that allows learners to revisit earlier stages of thinking and ideation. They agreed with the findings of Gyabak et al. (2015)

that iterative thinking enhances learners' problem-solving skills and cognitive flexibility.

This article establishes that empathy, reflection, and emotional engagement are central to meaningful design learning. Teachers noted the significance of emotionally safe spaces where learners can take creative risks, make mistakes, and learn from them. It aligns with the principles of human-centred design and emphasises emotional intelligence in effective pedagogy (Potts, 2022; Beh et al., 2018). This finding aligns with those of several previous studies (Shapira et al., 2017; Van Deventer, 2021) that recognise the affective domain as key to learner engagement and motivation.

Furthermore, the results reveal that many teachers struggle to interpret and implement curriculum documents such as the CAPS and PAT. Whereas some teachers were familiar with the design curriculum, others were confused or had a limited understanding of its components. This reinforces the arguments of Clercq (2020) and Cassim (2013) that curriculum reform must be accompanied by guidance and ongoing teacher support. The need for targeted professional development, especially for integrating cognitive and affective elements of the design process, emerged strongly from the data.

Another important finding is the effectiveness and functionality of the D+NQ Model. As an emergent tool, it offers a practical, stage-based approach to guide learners and analyse their design processes. The model's use of iterative loops and critical reflection (CRIT) stages helped learners to refine their ideas and improve their prototypes. Although in an early implementation phase, the D+NQ Model has proven to be a promising tool for navigating the complexities of Design learning in diverse educational contexts. Its alignment with DT's core values, empathy, experimentation, and collaboration, makes it adaptable to both well-resourced and under-resourced schools.

In line with Self-Determination Theory, the D+NQ Model satisfies learners' psychological needs by allowing autonomy through open-ended tasks, competence through structured steps, and relatedness through group work and peer feedback. These results align closely with those of Ryan and Deci (2000) and Regudon et al. (2022), who maintain that learners in environments that meet these three needs have greater intrinsic motivation and engage more.

The findings of this article underscore the importance of teacher understanding, emotional intelligence, and curriculum clarity in the successful implementation of DT in South African schools. The dual-process approach blending linear and iterative thinking enables both structure and creativity. In addition, the D+NQ Model strikes this pedagogical balance. As such, the research contributes to ongoing discussions about the transformation of education through human-centred, innovation-driven teaching practices. It offers both theoretical insights and practical pathways for teachers seeking to prepare learners for a rapidly changing world.

At its core, the D+NQ Model is defined by simplicity, empathy, and purposeful support. It breaks the design process into clear, manageable steps that ease learner confusion and reduce overwhelm. Therefore, by encouraging continuous questioning, learners are prompted to pause, reflect, and make stronger connections in their thinking. The model is flexible and teacher-friendly, offering a reliable structure that supports both creative expression and academic learning. Importantly, it acknowledges the everyday realities of South African classrooms, limited resources, diverse learning needs, tight schedules and provides a practical way to navigate them. Its strength lies in restoring clarity, confidence, and a human touch to the teaching and learning of Design.

Recommendations

Based on the findings, the following recommendations are made:

- Provide targeted training to enhance Design teachers' understanding of both the cognitive and the emotional aspects of the design process, including CAPS and PAT curriculum interpretation.
- Promote a balanced teaching approach that combines structured, step-by-step methods

with flexible, iterative strategies to support creativity and problem-solving.

- Create supportive school environments that value emotions and empathy in Design education, address teacher stress, and encourage learner collaboration and socially responsible thinking.

Conclusion

This study demonstrates the significant potential of a thoughtfully designed framework to support design thinking in educational settings. By exploring how teachers interpret and implement the design process, the research highlighted the diverse approaches that influence learners' engagement, creativity, and problem-solving abilities. Because both structured and flexible methods have unique strengths, a balanced combination of them supports meaningful learning experiences. The introduction and testing of the D+NQ Model in this context provided valuable insights into how a stage-based, iterative framework can effectively guide learners through complex tasks. The model's emphasis on reflection and continual refinement not only develops learners' practical skills but also fosters important cognitive and emotional qualities such as resilience, adaptability, and confidence.

Moreover, the study revealed the importance of supportive learning environments where learners feel empowered to explore ideas, collaborate, and embrace challenges without fear of failure. This emotional and social dimension is essential in nurturing motivated, engaged, and self-directed learners. Despite some challenges related to curriculum clarity and teacher preparedness, the findings suggest that with appropriate guidance and resources, teachers can successfully integrate innovative design practices that inspire learners and develop essential future-ready skills.

Overall, this research underscores the value of combining clear instructional frameworks with flexibility and empathy in teaching. The D+NQ Model is a practical and adaptable tool that bridges the gap between theory and practice, providing learners with a meaningful pathway to develop their critical thinking and creativity. Therefore, by supporting teachers and empowering learners, this approach contributes to transforming educational practices and preparing young people to navigate an increasingly complex and dynamic world with confidence and innovation

Conflict of Interest

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