

Constructing school identity in Türkiye: a grounded theory of dyno-holarchic ecosystems

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Constructing School Identity in Türkiye:

A Grounded Theory of Dyno-Holarchic Ecosystems

Educational institutions in Türkiye are undergoing significant structural changes in response to digital transformation, reshaping pedagogy, identity and community relations. Despite these developments, limited research examines how such dynamics redefine school identity. This study investigates school identity and proposes an integrated model of dynamic socio-technical ecosystems. Using a grounded theory (GT) design based on qualitative data, the study draws on semi-structured interviews with 8 academics across different universities, 12 school principals, 12 teachers and 12 students across six schools. The findings indicate the need to balance digital integration with stakeholders' social and psychological well-being to sustain school identity in rapidly evolving educational environments. The proposed Dyno-Holarchic School Model offers a socio-technical reconceptualisation of school identity and makes a theoretically grounded contribution to the literature. The study suggests directions for designing resilient, inclusive and future-ready schools while offering practical implications for policymakers and practitioners.

Keywords: Socio-technical, social constructivism, grounded theory, school identity, dyno-holarchic, human-centered

Introduction

In the 21st century, education has undergone significant transformation driven by technological developments, globalisation and evolving societal demands. Schools are no longer viewed merely as institutions for knowledge transmission; rather, they are increasingly expected to function as dynamic learning environments that respond to the complexities of digitalisation and changing learner needs (Wang et al., 2024). In this context, schools are expected not only to foster digital literacy, inclusivity and future readiness (Stanistreet, 2023; WEF, 2020), but also to address growing concerns about a socially detached and sedentary generation lacking empathy and critical thinking skills.

Global reports (OECD, 2025; UNESCO, 2021) emphasise the need to redefine school identity in the digital age through adaptive and equitable ecosystems, including a new social contract for education grounded in human rights and sustainability. Alongside digital transformation, global challenges such as pandemics,

migration and climate crises have further intensified the need to reconsider the role of schools (Klopsch and Sliwka, 2025). Within this framework, scholars argue that human-centred values such as belonging, trust, equality and inclusivity should remain central to the future of education (Zou et al., 2025). At the same time, digital transformation, while offering significant opportunities, has also reignited longstanding concerns about inequality, widening gaps in access and deepening systemic divides (Anger and Plünnecke, 2022; Bilotserkovets et al., 2021).

These transformations span digital learning environments (OECD, 2025), teacher professional development (UNESCO, 2021) and the integration of artificial intelligence into education (WEF, 2020). However, there remains a need for integrative theoretical frameworks capable of explaining how school identity is shaped within these intersecting technological, ethical and societal pressures.

Comparative evidence further illustrates these dynamics. Eurydice findings indicate that countries such as Germany, Austria, Sweden and Hungary continue to face challenges in reconciling technological innovation with traditional educational structures, whereas countries including Finland, Denmark, South Korea and Canada have more successfully integrated digital learning environments into school systems (Birch and Parveva, 2023; OECD, 2023b; Schroeder, 2016). These differences suggest that innovation alone is insufficient without research-based models that clarify how school identity evolves within socio-technical systems (Alpaydın and Demirli, 2022; Markham and Aveyard, 2003). While digitalisation offers new opportunities, it may also risk marginalising social learning spaces and humanistic values, with important implications for students' socialisation and well-being (Nielsen, 2016; Sergiovanni, 2015).

Within this global context, Türkiye represents a particularly relevant case. In recent years, research has increasingly focused on schools' challenges, opportunities and future orientations. National reforms led by the Ministry of National Education (MoNE) have aimed to align schools with 21st-century skills through curriculum updates, e-learning platforms, smart boards and digitally supported learning environments (MoNE, 2018; 2024b, 2026). Building on these initiatives, the recently introduced Maarif Model is grounded in competence-based and values-oriented learning, with a focus on enhancing teacher quality and ensuring equitable access to digital resources (MoNE, 2024c). This direction aligns with the integrated

perspective proposed in this study, which brings together psychological, sociological and technological dimensions into a coherent framework of school identity. The urgency of this transformation is further emphasised in the Twelfth Development Plan of the Presidency of the Republic of Türkiye, which highlights the post-pandemic role of schools in increasing student engagement and aligning with international benchmarks such as PISA and TIMSS (Presidency of the Republic of Türkiye, Directorate of Strategy and Budget [SBB], 2023). Nevertheless, despite strong policy emphasis, challenges in implementation persist. In response to these gaps and based on the above understanding, this study proposes a three-dimensional school identity model that conceptualises schools as inclusive, dynamic, holarchic and socio-technical ecosystems. Guided by social constructivist theory and grounded in empirical data, it aims to answer the following research questions:

RQ1: How do academics, school principals, teachers and students conceptualise school identity within socio-technical learning environments?

RQ2: What categories and themes characterise participants' perceptions of an ideal school and how do these relate to the proposed improvements in educational processes?

RQ3: Within the context of social constructivism, what theory or theories can explain the construction of school identity?

Theoretical Foundations

Global social expectations and increasingly complex pedagogical demands have intensified the need to re-examine the fundamental dimensions of school identity. Although digitalisation is a key driver of this shift, global disruptions such as pandemics, migration and environmental crises have simultaneously reshaped both the operational structures and the social roles of educational institutions, positioning schools not only as instructional spaces but also as sources of stability and community.

International reports (OECD, 2025; UNESCO, 2021; WEF, 2020) therefore call for educational models that integrate inclusivity, digital competence and institutional resilience. At the same time, scholars emphasise that humanistic values such as belonging, empathy and trust remain central to sustaining the societal

legitimacy of schools (Sergiovanni, 2015; Zou et al., 2025). However, despite these developments, a coherent theoretical integration of socio-technical change and school identity formation remains underdeveloped.

This study addresses this gap by proposing a grounded theoretical model that integrates psychological, sociological and technological dimensions of school identity. Anchored in social constructivism and ecosystemic thinking, the study examines how identity is constructed, transformed and sustained within complex educational environments shaped by digital transformation and institutional change. The following section outlines the conceptual foundations of this approach and justifies the treatment of school identity as a socio-technical construct shaped by both internal dynamics and external systemic pressures.

School Identity. School identity is commonly defined as a combination of shared characteristics, collective resilience and institutional continuity (Senge, 2006; Wolff, 2001). However, it extends beyond organisational structures to encompass the sociological and psychological processes through which institutions and communities interpret and position themselves. From this perspective, social identity theory suggests that identity is shaped by individuals' sense of belonging to social groups, positioning schools as key sites for the construction of both academic and social identities (Stryker and Burke, 2000). This view is further supported by Sayed et al. (2016), who emphasise that identity is continuously negotiated through interactions among individuals, institutions and societal norms.

From a human needs perspective, Max-Neef (1991) identifies fundamental ontological needs (being, having, doing, interacting) alongside axiological needs such as identity, protection, affection, understanding and participation. This framework positions schools as environments where instructional goals intersect with socio-emotional needs, reinforcing their dual role as spaces of learning and belonging. Within this framework, identity plays a central role in shaping students' sense of value and competence within both educational and social contexts.

In this study, school identity is conceptualised as a multi-layered socio-technical construct reflecting the interaction between internal dynamics (e.g., values, norms and relational patterns) and external systemic

pressures (e.g., digitalisation, equity demands and social reconstruction). Accordingly, identity is treated as a dynamic process shaped through ongoing interaction and transformation, rather than a fixed institutional attribute. This conceptualisation provides the basis for understanding educational ecosystems as resilient, inclusive and future-oriented structures. Building on this perspective, the following section examines social constructivism as a key theoretical lens for analysing identity formation in interactive learning environments.

Social Constructivism. Social constructivism provides a theoretical framework for explaining how school identity emerges through participatory meaning-making, particularly under conditions of institutional change (Vygotsky, 1978). In this study, it is used to examine how relational processes among students, teachers and school principals shape institutional culture.

Within this perspective, learning is understood as an interactional process in which individuals construct meaning through engagement with others and with symbolic tools. The concept of the zone of proximal development highlights how learning is facilitated through guided participation and scaffolding (Bentham, 2002). Accordingly, teachers function as facilitators of inquiry rather than transmitters of knowledge, supporting students' active role in constructing understanding and agency (Woolfolk, 2008).

Applied to school identity, this framework conceptualises identity as co-produced through ongoing interaction among multiple stakeholders, including students, teachers, principals and academicians. Identity is therefore treated as a dynamic and negotiated process rather than a fixed institutional attribute.

These relational principles align with the Pedagogical Frontiers dimension of the Dyno-Holarchic framework, which emphasises learner agency, personalised learning and dialogical interaction. In this respect, educational ecosystems are understood to develop not only through structural reform but through participatory processes grounded in communication and shared understanding.

The affective dimension of identity is further informed by humanistic education. Rooted in the work of Rogers (1983), this perspective emphasises emotional well-being, autonomy and meaning-making as central to learning. Teachers are positioned as facilitators who support students' intrinsic motivation and personal development (PourAli et al., 2017). The model proposed in this study reflects this orientation by

integrating student agency and teacher autonomy while also recognising the socio-economic and cultural limitations of purely humanistic approaches (Woolfolk, 2008).

Socio-technical ecosystem. The concept of a socio-technical ecosystem emphasises the interaction between structural, technological, pedagogical and sociocultural elements within educational settings (Clayton and Shafique, 2025). In this study, schools are conceptualised as dynamic environments shaped by interpersonal relationships, digital infrastructures, spatial organisation and shared cultural practices. This perspective highlights interconnectedness and positions well-being, safety and cultural continuity as central to meaningful learning (Lankers et al., 2023).

Empirical findings indicate that participants consistently described schools as environments that ensure emotional safety, support cultural belonging and provide structured learning opportunities. These accounts suggest that school identity functions as an emergent property of evolving techno-cultural systems in which emotional security and institutional adaptability intersect (Carpenter, 2025).

This interpretation aligns with ecological systems theory, which situates development within interacting environmental layers (Bronfenbrenner and Ceci, 1994), but extends it by conceptualising school identity itself as a socio-technical outcome shaped through pedagogical, organisational and communicative processes. While ecological and systemic approaches frame schools as multi-layered environments (Bronfenbrenner and Ceci, 1993, 1994; Fullan and Quinn, 2024), they do not explicitly explain how identity is produced under conditions of digital transformation.

The Dyno-Holarchic Ecosystem Model addresses this gap by specifying identity formation as emerging from the interaction of (i) pedagogical processes, (ii) institutional adaptation and (iii) communicative-relational dynamics. From this perspective, schools operate as embedded socio-technical systems shaped by external forces such as policy, technology and social interaction. Accordingly, effective systems require structural coherence, transparent communication, trust-based relationships and pedagogical flexibility (Chang and Uden, 2008).

Comparative evidence further indicates that digital transformation involves systemic reconfiguration rather than technological adoption alone, integrating governance, equity, pedagogy and institutional development

(Giattino and Stafford, 2019; OECD, 2023a). Within this framework, schools are conceptualised as dyno-holarchic ecosystems, adaptive and layered systems that respond to internal and external change. This perspective underpins the Transformative Habitats dimension of the model, explaining how schools sustain identity while adapting to complex socio-technical conditions.

Dynamic holarchic structure. The concept of holarchic structure provides a framework for understanding how schools balance structural coherence with adaptability. A holarchy refers to an organisational system in which autonomous units operate as parts of a larger whole (Fischer, 1999), supporting open communication, mutual respect and participatory decision-making (Shaked and Schechter, 2017).

Recent scholarship suggests that educational organisations increasingly function as nested, networked and adaptive systems rather than linear hierarchies (Fullan and Quinn, 2024; OECD, 2025). Within this perspective, holarchic structures explain how institutions maintain coherence while allowing sub-units to respond flexibly to contextual demands (Koestler, 1967; Robertson, 2015).

Building on this literature, the Dyno-Holarchic Ecosystem Model conceptualises school identity as a holarchically produced outcome shaped through pedagogical interaction, institutional adaptation and communicative processes under conditions of digital transformation. This approach extends existing ecological and leadership models by focusing explicitly on identity formation rather than organisational functioning alone.

The model further incorporates a structural logic in which nested units retain functional autonomy while contributing to system coherence (Koestler, 1967; Koul and Nayar, 2020). This perspective foregrounds distributed coherence and explains how identity can remain stable despite changes in practices, technologies or roles (Shah, Lopes Cardozo and Hjarrand, 2024).

Within this framework, “dyno-holarchic” refers to the integration of dynamic adaptation and holarchic governance. Although formal leadership structures persist, decision-making is characterised by shared authority, dialogue and trust-based relationships (Muff, 2016; Robertson, 2015), with organisational change sustained through collective engagement (Farkhondeh and Müller, 2021; Robertson, 2015).

This structural orientation underpins the Transformative Habitats dimension of the model by explaining how leadership, institutional culture and organisational processes interact to support adaptive and participatory change, positioning school identity as an evolving construct within broader socio-technical ecosystems (Schell and Bischof, 2021).

Communicative action. The concept, as developed by Habermas (1987), refers to processes of mutual understanding and meaning-making achieved through dialogical interaction. Unlike instrumental action, it emphasises consensus, shared values and collective reasoning within a social context. In educational settings, communicative action functions as a key mechanism for sustaining the cultural meanings and normative structures that constitute the institutional lifeworld.

Within schools, the lifeworld encompasses shared beliefs, practices and community norms that shape institutional identity and guide social interaction. These elements contribute to schools' capacity to respond to the intellectual, social and cultural needs of their communities (Sergiovanni, 2015).

In this study, the Communal Dynamics dimension of the Dyno-Holarchic School Identity Model is grounded in communicative action theory. School identity is conceptualised as emerging through interactional processes that foster trust, belonging and shared responsibility. In this respect, identity is produced through communication rather than imposed through formal structures (Habermas, 1987). This view is further supported by Hillebrandt (2018), who highlights the role of communicative spaces in shaping institutional reflexivity and cultural awareness.

Within increasingly complex socio-technical environments, the sustainability of school identity depends on the continuity of such communicative processes. Accordingly, the model emphasises shared meaning, participatory decision-making and inclusive dialogue as core conditions for maintaining and transforming school identity.

Educational Context in Türkiye

In Türkiye, recent years have seen a marked acceleration in planning, strategic development and reform efforts related to future-oriented schooling (DSB, 2023; MoNE, 2024b, 2024c, 2025). These developments align with broader international discussions on digital transformation, the evolving role of teachers and the

impact of digitalisation on learning environments (Hess and Allwein, 2024; Wang et al., 2024). However, existing research provides limited insight into how school identity evolves at the intersection of social, psychological and technological change. This gap appears particularly salient in the Turkish context, where rapid digitalisation coexists with ongoing socio-economic inequalities. Consequently, there is still a need for integrative models that can link evolving conceptions of school identity with both systemic processes and practical applications (Alpaydın and Demirli, 2022). Within this context, education reform in Türkiye is often framed through system-level indicators and policy narratives (DSB, 2023; MoNE, 2025), while participatory and practice-oriented studies that incorporate student and teacher perspectives on future learning environments remain relatively limited (Altıok and Conti, 2024; Göçen et al., 2020). In this respect, qualitative research can offer valuable insights into how educational transformation is experienced and interpreted at the school level.

Türkiye's education system has historically been characterised by a centralised governance structure, in which curriculum design, assessment frameworks and leadership roles are largely shaped by national-level decision-making (Kılınç et al., 2025). While this structure has supported standardisation and broad access, it has also limited schools' capacity to develop context-sensitive institutional identities and locally responsive practices (Bellibaş and Gümüş, 2023; MoNE, 2024c; MoNE, 2025). Within this context, school identity has often been shaped through alignment with policy frameworks rather than through participatory processes involving stakeholders. Similarly, school leadership has frequently been positioned as implementation-oriented, with less emphasis on mediating institutional meaning or identity formation (Bellibaş, Karaferiye and Walker, 2025). The Dyno-Holarchic Ecosystem Model responds to this context by conceptualising school identity as a negotiated and adaptive construct, enabling schools to maintain coherence while expanding relational autonomy, communicative agency and pedagogical flexibility within national structures.

Türkiye also represents a relevant case within global educational debates. Improvements in international assessments such as TIMSS and PISA have been associated with teacher quality, curriculum reform and the expansion of technology-supported learning environments (OECD, 2022; OECD, 2023a; von Davier et al.,

2024). At the same time, several structural challenges persist. Despite an education budget reaching 2.186 trillion Turkish lira in 2025, corresponding to 14.84 percent of the central government budget, issues such as school dropout remain a concern, with a reported rate of 6.7 percent (EUROSTAT, 2023; NCES, 2024). In addition, factors including digital equity gaps, teacher preparedness and the socio-emotional implications of digital learning continue to shape reform outcomes (Altıok and Conti, 2024; Higgins et al., 2005; Sezgin, 2014).

Review of existing research. National and international research on future schooling has examined multiple dimensions, including student participation, digitalisation and leadership (OECD, 2025; Plaku and Leka, 2025; Yelland et al., 2022). These studies highlight the interaction between educational environments and broader societal transformations (Costa, 2024; Lan, 2024), as well as the role of institutional perspectives in shaping reform processes (Göçen et al., 2020). Prior research also emphasises the importance of teacher–student relationships (Järvelä, 2011) and the influence of cultural, historical and organisational structures on school environments (Costa, 2024; Palfreyman, 2014).

Research in socially and culturally constrained contexts further shows that alternative school models can address structural and social challenges. Studies indicate that collaborative approaches involving students, teachers, school principals and academicians contribute to future-oriented school models and enhance professional satisfaction, particularly among teachers (Ertürk et al., 2025; Zou et al., 2025). Similarly, research incorporating student perspectives highlights the importance of student voice in shaping educational change and supports more individualised school models (Klopsch and Sliwka, 2025; Leshem et al., 2015; Simmons and Thomas, 2015; Thissen and Stang, 2024).

In the Turkish context, studies examining schooling during crises such as pandemics, disasters and conflict emphasise the role of socio-emotional skills, civic participation and family support (Altıok and Conti, 2024; Saavedra, 2020). However, the highly centralised governance structure continues to shape school practices, requiring principals to balance national policies with local needs (Hilal et al., 2022; Karaferye and Bellibaş, 2025). While principals play a key role in sustaining school identity, top-down decision-making often constrains schools' capacity to develop context-specific institutional identities (DSB, 2023; MoNE, 2024a).

As a result, research in Türkiye has largely focused on classroom or spatial dimensions of identity, with limited attention to school identity at the institutional level (Göçen et al., 2020). More recent studies have begun to address identity formation in relation to digital technologies and artificial intelligence, although this line of research remains limited (Alpaydın and Demirli, 2022; Ertürk, 2026).

Beyond institutional structures, identity is also shaped by students' sense of belonging and social integration. Research consistently shows that belonging enhances resilience and academic achievement, whereas its absence is associated with disengagement and early school leaving (Juvonen, 2006; Osterman, 2000; Reicher and Matischek-Jauk, 2018; Schlesier et al., 2025; Sidorkin, 2004). These findings indicate that school success is closely linked to social connectedness rather than academic outcomes alone.

Given these developments, the role of schools requires reconsideration within rapidly changing social and technological contexts. Recent studies examine evolving school roles and responses to societal expectations, including the integration of global and local dynamics (Bilotserkovets et al., 2021; Dorfsman and Horenczyk, 2022; Picci and Cancellara, 2020; Scully et al., 2021; Starkey et al., 2021). International scenarios further suggest that schools may increasingly function as centres of social interaction in response to technological change (OECD, 2020, 2025). For Türkiye, a key question is how these trajectories align with national structures and cultural conditions.

Finally, methodological research highlights the growing use of GT in education and management. GT has been applied to examine complex social processes (Lakshman, 2007; Machin et al., 2012), while recent studies emphasise its interpretive flexibility, particularly within constructivist approaches (Apramian et al., 2016; Makri and Neely, 2021; Stough and Lee, 2021; Charmaz and Thornberg, 2020). Methodological frameworks for GT design and analysis (Abdellah, 2016; Fei and Shuangyan, 2024; Siu et al., 2025) informed the research design of the present study.

Method

This study employed a constructivist GT design to explore how school identity is constructed within socio-technical contexts. GT was selected for its capacity to generate theory inductively from empirical data and to capture complex, context-dependent social processes. Within this framework, school identity was

conceptualised as a socially constructed and dynamically evolving phenomenon shaped through participants' experiences and interactions.

Research Design

The study followed the core principles of GT, involving iterative cycles of data collection, coding and theoretical development (Charmaz, 2024; Urquhart, 2023). Data analysis was supported by MAXQDA to organise coding processes and memo development. Coding decisions were continuously refined through constant comparison, allowing emerging categories to inform subsequent stages of data collection and analysis (see Fig. 1).

Fig. 1. Methodological Workflow of the Research Based on Grounded Theory

Source: Authors' own work.

Research Process

Participants

A purposive and theoretical sampling strategy was employed to capture diverse perspectives. The final sample comprised 44 participants from varied socio-economic and cultural contexts. Within the scope of this study, 12 school principals, 12 teachers and 12 students were recruited from six public middle schools located in Ankara (NUTS TR5), the capital of Türkiye, which is characterised by intense internal migration and a socio-economically heterogeneous structure. 8 academic participants specialising in education management and administration from different universities in Türkiye were drawn from four different NUTS regions (TR5, TR6, TR8 and TR10). All teachers and principals had a minimum of three years of experience in education and direct involvement in school systems. For the student participants, attention was paid to selecting those enrolled in middle school, specifically the age group that experienced hybrid learning during the pandemic.

The interview protocol was developed on the basis of an extensive literature review and reviewed by four experts in philosophy, psychology, educational measurement and educational sciences. Pilot testing was

conducted with five teachers and three administrators, after which the final version of the protocol (Supplementary information 1) was approved (Approval No: E-344372, Decision No: 8 and Approval No: E-359575) by the institutional research monitoring committee (Miles, Huberman and Saldaña, 2020). Demographic variables of participants are presented in Table 1.

Table 1 Basic Information of Participants.

Source: Authors' own work.

Data collection

Data were collected during the 2022–2023 academic year through semi-structured interviews conducted in both face-to-face and online formats. The interview protocol was developed based on an extensive literature review and refined through expert feedback from four academics in philosophy, psychology, measurement and evaluation, and educational sciences (Adams, 2015; see Supplementary Information 1). Interviews lasted between 30 and 60 minutes and focused on participants' perspectives on school identity formation. All interviews were audio-recorded and transcribed verbatim. Memo-writing was used throughout the process to capture emerging insights and support iterative analysis.

Ethical Considerations

Prior to initiating the study, ethical approval was obtained from Gazi University Ethics Committee on 22 April 2022 (Approval No: E-344372, Decision No: 8) as well as research permission from MoNE on 13 May 2022 (Approval No: E-359575). All research activities strictly adhered to established ethical guidelines for scientific inquiry. Recognising the sensitivity of qualitative research, protective measures were rigorously applied to safeguard participants' rights and data integrity. These measures included the maintenance of participant anonymity, secure coding procedures and transparent reporting of findings, in line with principles of honesty and accountability (Myers, 2008; Maylor and Blackmon, 2005; Saldaña, 2025).

Ensuring the validity and reliability of the study further required ethical rigour across all stages of data collection, analysis and interpretation. In accordance with Lincoln and Guba's (1985) criteria for qualitative

trustworthiness, strategies addressing credibility, transferability, dependability and confirmability were systematically implemented. A clear chain of evidence, which is central to GT, was sustained through saturation testing, detailed documentation and the use of figures, tables and infographics to support constant comparison and demonstrate theoretical saturation (Urquhart, 2023).

Data Analysis and Coding Processes

Data from the semi-structured interviews were audio-recorded, transcribed verbatim using Voicedocs and prepared for analysis. Initial data handling and open coding were conducted manually in Microsoft 365 to maintain close engagement with participants' language. Digital techniques (MAXQDA for coding and comparison; MindMeister for visual mapping) were then used to organise and analyse the data. This combined approach enhanced analytical rigour and aligned with GT principles (Bryant and Charmaz, 2019; Urquhart, 2023).

Open (Preliminary) Coding. Codes were generated inductively and remained close to participants' own words in order to capture immediate perceptions, emotions and interpretations of school identity within socio-technical learning environments. Using pseudonyms (Academician A1, Principal P1, Teacher T1, Student S1), the researcher examined the raw data to generate initial codes that encapsulated key ideas, actions and meanings during the open coding stage (Table 2). Illustrative coding examples are provided in Supplementary Information 2.

This phase prioritized the authenticity of participants' voices by excluding secondary data sources such as literature, thereby maintaining the primacy of participants' perspectives (Duchscher and Morgan, 2005).

Table 2 Example Process of Transformation from Raw Data to Concepts (Ordered by Raw Data). Source: Authors' own work.
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Table 2 illustrates the initial coding process, demonstrating how raw excerpts from participants' accounts were systematically transformed into preliminary nodes and conceptual categories. Details of the data obtained from the raw data during the open coding stage are provided in Supplementary Information 2. As an outcome of this process, the data were tabulated with themes (indicated as C+serial numbers), categories

and notes capturing different aspects of school identity formation (Table 3).

Selective (Focused) Coding. Selective coding constituted the analytically pivotal second stage of the GT process, in which salient open codes were synthesised into conceptually meaningful categories (Charmaz, 2024). Guided by Glaser's (2005) formulation and informed by Charmaz's constructivist GT, this stage enabled the analysis to move beyond descriptive coding toward higher levels of conceptual abstraction (Table 3, 4).

Theoretical Coding. Theoretical coding constituted the final stage of analysis, integrating categories into an explanatory framework aligned with the research questions (Charmaz, 2024; Urquhart, 2023). This stage focused on relationships among categories through constant comparison across participant groups and analytic levels (see Supplementary Information 3). The resulting theoretical categories represent higher-order abstractions derived from cross-group patterns and form the conceptual basis of the proposed ecosystem model of school identity. These categories integrate related subcategories (e.g., autonomy, support, emotional climate), enabling a multidimensional explanation of identity construction across socio-technical contexts.

Memo Notes. Analytic memos were recorded throughout the process to support theoretical sensitivity and track emerging interpretations. Informed by symbolic interactionism, memo-writing facilitated the identification of relationships among concepts and guided the development of theoretical insights (Charmaz, 2024). The process involved iterative comparison and integration of emerging categories (see Supplementary Information 4).

Coding Validation, Theoretical Saturation and Analytical Trustworthiness

Coding was conducted primarily by S.E in accordance with the GT procedures outlined in Figure 1. All interviews were transcribed verbatim using the Voicedocs transcription tool and prepared for analysis. Line-by-line open coding produced 164 initial codes (Table 2). Following constant comparative analysis and

expert feedback, conceptually overlapping codes were merged, resulting in a refined set of 157 codes (Table 3). These were organised into 21 categories and 55 initial concepts. During selective coding, minor overlap between two themes was resolved through thematic integration, resulting in 54 final subcategories nested within 21 overarching themes that constitute the Dyno-Holarchic Ecosystem Model (Table 4).

The consolidated list of codes, subcategories and themes was reviewed by three external experts, including two full professors and one associate professor with expertise in Educational Leadership, Qualitative Research Methods and GT. Their feedback informed the refinement of category boundaries and strengthened thematic coherence.

Theoretical saturation was assessed through iterative comparison and expert validation (Glaser, 2005; Fei and Shuangyan, 2024). A subset of themes was examined to evaluate conceptual overlap and category sufficiency. No additional codes, categories or themes emerged across successive analytic iterations, indicating that saturation had been achieved and supporting the explanatory adequacy of the model.

Rather than relying on inter-coder agreement coefficients, analytical trustworthiness was established through expert consensus, reflexive analysis and theoretical sensitivity (O'Connor and Joffe, 2020). In line with Lincoln and Guba's (1985) framework, credibility, transferability, dependability and confirmability were addressed throughout the analysis. A clear chain of evidence was maintained through figures, tables and supplementary materials that documented constant comparison and category development (Urquhart, 2018).

Findings and Results

Findings related to RQ1, which examines how academics, school principals, teachers and students conceptualise school identity within socio-technical learning environments, are presented through the nodes shown in Table 2 and Supplementary Information 2. As a large number of open codes emerged during the initial coding phase, the researchers organised the raw data into analytically meaningful concepts (Table 2). For example, participants' statements describing schools as restrictive, test-oriented or limiting students'

individuality were coded under concepts such as ‘School as a Dehumanizing Institution’ (A1) and ‘Critique of Test-Oriented Education’ (A3).

Findings related to RQ2 indicate that participants’ conceptualisations of an ideal school cluster around categories such as sensitivity, inclusivity, equity, emotional and professional support, instructional environment, pedagogical design, autonomy and student-centred interests (see Table 3 and Supplementary Information 2). The subcategories, nodes and thematic framework derived directly from open coding are further consolidated in Table 3.

Table 3 Initial Concepts and Categories Formed through Open Coding.

Source: Authors’ own work.

Table 3 above presents the initial concepts, categories and nodes generated through open coding. At this stage, codes were organised inductively on the basis of semantic similarity and analytic proximity. For instance, Relational Trust (C19) emerged from open codes reflecting participants’ repeated references to affective safety, emotional bonding, collaboration and mutual respect. This theme was primarily grounded in subcategories such as affection and emotional bonding, family collaboration, supportive relationships and teacher–student engagement, all of which were frequently articulated by teachers, school leaders and students in describing everyday interactions and expectations within a trustworthy school environment. Similarly, Teacher Dignity (C8) was constructed from codes related to professional recognition, appreciation culture and institutional acknowledgement of teachers’ efforts. These codes derived from participants’ statements emphasising respect for teachers’ professional identity, motivation and emotional well-being, particularly in narratives concerning leadership support, recognition practices and professional fulfilment.

With regard to RQ3, data derived from the sub-questions directed to participants (Supplementary Information 1) were initially organised through open coding under the concepts and categories presented in Table 3. The structures shown in Table 3 reflect codes derived directly from the raw data and represent

the first level of conceptual grouping. Following these analytical steps, the initial concepts were reorganised into higher-order themes and subcategories and the outcomes of selective coding are presented in Table 4.

Table 4 Results of Selective Coding.

Source: Authors' own work.

Codes related to extracurricular activities, holistic learning experiences, and students' sense of happiness, which appeared as separate initial concepts in Table 3, were integrated under the theme Holistic Schooling (C14) in Table 4 through memo notes and theoretical coding. Similarly, codes associated with justice, fairness, and a sense of belonging, initially grouped under institutional justice in Table 3, were consolidated under the theme Ethical Belonging (C6) during the selective coding stage.

When the initial codes, categories, and themes derived from participant data were considered together with memo notes and theoretical coding through constant comparative analysis, the 'ecosystem' metaphor emerged inductively from the data (Fig. 2; Sup. Info. 4). Memo notes recorded during the interviews further indicated that participants consistently described schools as safe, supportive, and life-sustaining environments, while emphasising the need for peace, well-being, and relational balance. These findings are visualised together with the relevant codes in the Memo Note Coding Map (Fig. 2; Sup. Info. 4).

Fig.2. Thematic Coding Map of Memo Notes

Source: Authors' own work.

Memo notes supported the organisation of codes by enabling the clustering of conceptually related categories, including psychosocial needs, human agency, spatial belonging, institutional trust, equitable access and professional recognition, on the basis of semantic proximity and functional similarity. During theoretical coding, codes related to psychosocial needs, emotional sensitivity, human agency and personalised learning were organised under the themes Psychosocial Flourishing (C1) and Personalized Pathways (C18). Similarly, codes associated with spatial belonging, safe learning environments, comfort-oriented design and cultural responsiveness were grouped under Educational Landscapes (C16) and Spatial Enablers (C21). Codes related to institutional trust, appreciation culture, professional recognition and supportive relational networks were likewise consolidated under Relational Trust (C19) and Teacher Dignity (C8).

Model Construction: Constituent Elements of Dyno-Holarchic Ecosystem

The analysis resulted in a coherent model conceptualised through the metaphor of a dyno-holarchic ecosystem. As shown in Figure 3, the model comprises three interrelated dimensions: Pedagogical Frontiers, Transformative Habitats and Communal Dynamics. Figure 3 maps the 21 empirically derived themes (C1–C21) onto these higher-order dimensions. Each theme is positioned within its corresponding dimension, enabling a direct visual reading of the model structure (see Figure 3 legend).

Fig.3. Structural Model of School Identity in a Dyno-Holarchic Ecosystem

Source: Authors' own work.

Through constant comparative analysis across participant groups, selective coding identified 21 main themes and 54 subcategories (Table 4). Of these, eight themes were located within *Pedagogical Frontiers*: C1 Psychosocial Flourishing, C2 Equity Pedagogy, C3 Professional Proficiency, C4 Learning Agility, C10 Affective Climate, C11 Adaptive Environments, C14 Holistic Schooling and C18 Personalized Pathways. A further eight themes were grouped under *Transformative Habitats*: C6 Ethical Belonging, C7 Familial Capital, C9 Resource Alignment, C13 Relational Support, C15 Instructional Resilience, C16 Educational

Landscapes, C17 Augmented Learning and C21 Spatial Enablers. The remaining five themes constituted *Communal Dynamics*: C5 Institutional Scaffolding, C8 Teacher Dignity, C12 Vocational Fulfillment, C19 Relational Trust and C20 Affirmative Support.

Discussion

The model presented as a result of the study conceptualises the school as a socio-technical institution by demonstrating the interdependence of pedagogical, spatial and relational dimensions. Within the Pedagogical Frontiers dimension, themes such as Psychosocial Flourishing and Personalized Pathways highlight the importance of adaptability, digital integration and personalised learning (Göçen et al., 2020; Fullan and Quinn, 2024; OECD, 2024).

The Transformative Habitats dimension emphasises the spatial and psychosocial conditions of schooling and aligns with research that positions schools as environments capable of reducing structural inequalities and supporting well-being, particularly where institutional support is limited (Fullan and Quinn, 2024; OECD, 2024). The interaction between this dimension and the supportive role of teachers suggests that learning environments are more effective when organised around student needs, shared inquiry and contextual meaning-making.

The model also draws on principles of humanistic education, framing learning as child-centred and experience-based, with an emphasis on self-actualisation and learner agency (Aloni, 2011; Maslow, 1970; Rogers, 1983). Within this perspective, teachers function as facilitators rather than transmitters of knowledge. The findings also indicate limitations of purely humanistic approaches under contemporary conditions. Increasing reliance on digital learning, declining motivation and persistent socio-economic inequalities suggest that humanism alone is insufficient to address current educational challenges.

The Communal Dynamics dimension situates school identity within broader societal lifeworlds, consistent with studies highlighting schools as sites of meaning-making, belonging and resilience (Vygotsky, 1978; Habermas, 1987; Sergiovanni, 2015; Liu et al., 2022). Drawing on Habermas's Theory of Communicative Action, this dimension conceptualises schools as spaces that sustain shared values while enabling collective understanding (Habermas, 1987). Local cultural practices play a critical role in maintaining institutional

identity under conditions of rapid change (Sergiovanni, 2015).

The Dyno-Holarchic Ecosystem Model engages with established frameworks, including Sociocultural Theory and communicative action, while responding to contemporary calls for structural and pedagogical transformation (OECD, 2025; Wang et al., 2024). It also reflects broader socio-economic conditions. OECD (2024) data indicate significant disparities in public spending on family support, with countries such as France and Sweden exceeding 3% of GDP, while Türkiye remains below 0.5%. Under such conditions, schools often assume expanded roles in addressing unmet social and emotional needs. This is reflected in the Transformative Habitats and Communal Dynamics dimensions, which position schools as both educational and relational support systems.

Emerging school models further illustrate these dynamics. Hybrid learning, AI-supported instruction and learner-centred pedagogies are increasingly prominent (Alpaydın and Demirli, 2022; Klopsch and Sliwka, 2025). In Türkiye, the integration of technological tools with pedagogical design has been identified as a key priority (Göçen et al., 2020). In this context, technology functions as a cross-cutting element across three domains: learning design (Pedagogical Frontiers), spatial and emotional environments (Transformative Habitats) and school–community relations (Communal Dynamics).

The findings indicate that features such as pedagogical innovation, equitable resource use, professional collaboration and relational trust collectively shape school identity. These features reflect a holarchic structure embedded within broader socio-environmental systems. While consistent with ecological perspectives (Bronfenbrenner and Ceci, 1993, 1994; Ettekal and Mahoney, 2017), the study extends this approach by conceptualising school identity as an emergent socio-technical construct structured through interacting dimensions.

From a policy perspective, the Türkiye Century Maarif Model represents a relevant national framework. It emphasises holistic learning (Cansaran et al., 2025), values-based education and teacher development (MoNE, 2024c), aligning with broader international trends (OECD, 2025). The present study contributes to these frameworks by providing an empirically grounded model that translates holistic principles into a structured and operational ecosystem.

Through GT, the study conceptualises school identity as a dynamic holarchic system in which pedagogical, spatial and relational dimensions operate both autonomously and interdependently. In doing so, it moves beyond abstract notions of holistic education and offers a theoretically informed and practically applicable framework for educational leadership and policy.

Conclusions

This study addresses limitations in existing approaches to school identity by proposing a grounded theoretical model. It identifies a set of conceptual and practical action points based on changing perceptions of schools and expectations surrounding the construction of school identity.

Contributions

This study contributes to the literature by conceptualising school identity as a dyno-holarchic socio-technical ecosystem organised through pedagogical, spatial and relational dimensions. It extends existing research on school identity by proposing an empirically grounded model that integrates identity formation, institutional adaptation and communicative processes within a coherent conceptual framework. The study therefore offers a theoretically grounded contribution to educational research and to GT scholarship on school organisation.

Implications

The dyno-holarchic ecosystem model suggests that school improvement policies should move beyond linear reform approaches and adopt holarchic coordination mechanisms that recognise pedagogical, spatial and relational domains as interdependent policy units. For educational leadership, this implies a shift from role-based leadership models towards ecosystem-oriented leadership, in which instructional innovation, teacher dignity, student well-being and family engagement are designed as mutually reinforcing processes rather than isolated initiatives.

At the policy level, particularly within MoNE, the model provides a conceptual basis for operationalising holistic education agendas through multi-layered school governance frameworks. Rather than treating

curriculum reform, school climate and institutional support as separate policy domains, the holarchic ecosystem approach enables policymakers to design integrated school development strategies in which each component functions both autonomously and as part of a larger system. This offers a concrete pathway for translating holistic education principles into sustainable leadership practices and context-sensitive policy implementation.

Limitations

Despite its depth, this study presents several limitations:

Sample scope and generalizability. Within the scope of this study, school principals, teachers and students were recruited from six public middle schools located in Ankara (NUTS TR5), the capital of Türkiye, which is characterised by intense internal migration and a socio-economically heterogeneous structure. Academic participants were drawn from four different NUTS regions (TR5, TR6, TR8 and TR10) across the country. While this multi-layered purposive sampling strategy enabled the inclusion of diverse institutional and cultural experiences, the concentration of the sample within specific regional contexts may limit the national generalizability of the findings. Accordingly, the results should be interpreted within the framework of analytical and theoretical generalization rather than statistical generalization.

Analytical depth and comparative limitation. Although all major categories were observed across participant groups, variations in the frequency or thematic intensity of these categories were not systematically distinguished. As a result, the findings do not support fine-grained comparative interpretations or quantitative weighting of themes across groups.

Institutional context and researcher influence. Despite the interview protocols being tailored to each participant group, the broader institutional and administrative context in which the study was conducted may have subtly shaped both the formulation of questions and the analytical focus. Furthermore, although the coding process was supported by expert review, the interpretive nature of qualitative inquiry means that researcher subjectivity cannot be entirely eliminated.

Model validation. The three-dimensional Dyno-Holarchic Ecosystem Model proposed in this study was developed at a conceptual and theoretical level. Its empirical testing through applied interventions or

longitudinal implementation has not yet been undertaken.

Future Research Directions

Building on the limitations of the present study, future research should extend the analytical scope of the Dyno-Holarchic Ecosystem Model through multilevel, comparative and mixed-method designs. The three dimensions proposed in this study may be considered an initial GT based theoretical sampling, open to empirical refinement and validation across diverse educational contexts.

Empirical validation. Future studies should test the Dyno-Holarchic Ecosystem Model through mixed-method and quantitative designs, using validated scales related to school climate, relational trust, teacher dignity and student well-being.

Contextual and comparative research. Comparative studies across different NUTS regions in Türkiye and other countries as well as urban-rural and public-private school contexts would help examine the model's applicability under varying socio-economic and institutional conditions.

Longitudinal inquiry. Longitudinal research is needed to explore how pedagogical, spatial and relational dimensions of school identity evolve over time, particularly in response to digital transformation and organisational change.

Instrument development. Developing context-sensitive measurement tools that capture relational, spatial and socio-technical dimensions would strengthen empirical testing of the model.

Policy-oriented studies. Future research should investigate how the model can inform school leadership practices, intervention design and education policy through design-based or action research approaches.

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Author contributions

S.K contributed to the study's conception and design. Material preparation, data collection and analysis were performed by S.E. The first draft of the manuscript was written by the S.E. All authors read and approved the final manuscript.

Data availability

The data utilized in this study are proprietary to Gazi University and subject to confidentiality restrictions. Regrettably, we are unable to publicly share the data in its entirety. However, if readers have a specific interest or reasonable need to access the data, we encourage them to contact the S.E. for further details and potential arrangements.

Code availability

The data analysis for this study was conducted using Voicedocs Software, MAXQDA and MindMeister. The software was used to assist with coding and grouping qualitative interview data. Access to the research file is restricted due to privacy concerns, but the general methodology and coding structure can be shared upon request.

Competing interests

The authors declare no competing interests.

Ethical approval statement

This study was approved by the Gazi University Ethics Committee on 22 April 2022 (Approval No: E-344372, Decision No: 8) and research permission for data collection tools was granted by MoNE on 13 May 2022 (Approval No: E-359575). All procedures involving human participants were conducted in accordance with the ethical standards of the institutional and national research committees, the 1964 Helsinki Declaration and its later amendments and national regulations. Informed consent was obtained from all participants prior to the interviews, which were conducted between 2022-2023 education year.

Informed consent

Informed consent was obtained from all participants prior to data collection. Participants were clearly informed that the study was conducted solely for academic purposes, that it did not involve any physical, emotional or psychological risks and that confidentiality would be strictly maintained. Participation was entirely voluntary and individuals were explicitly notified of their right to withdraw at any stage without any repercussions. The data collection process began in September 2022 and was completed in January 2023 with data saturation test. During this period, semi-structured open-ended individual interviews were conducted. Prior to each interview, participants were briefed on the procedures and the sessions were audio-recorded with verbal consent obtained at the time of recording.

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Figure Legends

Fig. 1. Methodological Workflow of the Research Based on GT

This figure illustrates the stages of the GT methodology applied in the study. The process begins with data collection and preparation, followed by open coding, selective (focused) coding and theoretical coding. Throughout these stages, memos were systematically written to enhance theoretical sensitivity. A saturation test was conducted to determine whether additional data supplementation was required. Once saturation was

reached, core category sampling guided further analysis. Finally, findings were integrated through the constant comparative method, enabling the development of a coherent and theoretically grounded model.

Fig. 2. Thematic Coding Map of Memo Notes

The figure presents the thematic coding map derived from memos, structured around three main categories: *Personalization*, *Habitat* and *Praise*. Each category is linked to multiple sub-dimensions, including psychosocial needs, institutional trust, spatial belonging, cultural responsiveness and supportive relational networks. This mapping demonstrates how memos guided the clustering of dimensions into broader themes during the GT coding process.

Fig. 3. Structural Model of “School Identity in a Dyno-Holarchic Ecosystem”

The figure illustrates the structural framework of the School Identity Model, organised into three overarching domains. Each domain encompasses specific categories (C1–C21), such as psychosocial flourishing, ethical belonging, teacher dignity and institutional scaffolding, representing the multi-dimensional foundation of school identity.

1. Pedagogical Frontiers (purple): This dimension captures themes centered on instructional practices, learner development and adaptive educational processes (C1, C2, C3, C4, C10, C11, C14, C18).
2. Transformative Habitats (blue): This dimension encompasses spatial, ecological and familial conditions that shape schooling as dynamic learning environments (C6, C7, C9, C13, C15, C16, C17, C21).
3. Communal Dynamics (green): This dimension highlights institutional and relational structures that sustain school identity through trust, recognition and vocational grounding (C5, C8, C12, C19, C20).

Table 1 Basic Information of Individual Meeting Participants				
	Demographic Features	Categories	n	%
Academicians (n=8)	Gender	Female	2	25
		Male	6	75
	Research Area	Educational Administration and Policy, Inspection, Planning and Economics	5	62,5
		Educational Management, Educational Sciences	2	25,0
		Educational Administration, Guidance and Psychological Counseling	1	12,5
Principals (n=12)	Gender	Female	3	25,0
		Male	9	75,0
	Teaching Area	Maths	1	8,3
		Social Sciences	2	16,7
		English	2	16,7
		Science	3	25,0
		Information Technologies	1	8,3
		Primary School Teaching	1	8,3
		Child Development	1	8,3
		Physical Education	1	8,3
Teachers (n=12)	Gender	Female	8	66,7
		Male	4	33,3
	Teaching Content Area	English	4	33,3
		Guidance and Psychological Counseling	1	8,33
		Maths	1	8,33
		Physical Education Social Studies	1	8,33
		Science	2	16,67
		Social Studies	1	8,33
		Technology Design	1	8,33
		Visual Arts	1	8,33
Students (n=12)	Gender	Female	5	41,7
		Male	7	58,3
	Age	11	2	16,7
		12	7	58,3
		13	3	25,0

Table 2 Example Process of Transformation from Raw Data to Concepts (Ordered by Raw Data).	
Raw Data	Node
What will the school give to children? Aren't children individuals? If you're a humanist, that's the essence of being human. Does school liberate the individual? No, it enslaves. (Academician 1)	A1 School as a Dehumanizing Institution
School is more than a place where knowledge is transferred; it is an environment that suits the developmental characteristics of the child. (Academician 2)	A2 Holistic Development Focus
Focusing solely on academics and standardized testing is a major problem. Successful students may go into medicine but often lack communication skills. Doctors may neglect the social side of their profession, which is important for treating psychosomatic illnesses. Negative experiences in healthcare reflect educational failures. (Academician 3)	A3 Critique of Test-Oriented Education

Even the spelling of words has changed. Students used to read and summarize books. Now, they express themselves in short, superficial sentences. This affects language development and prevents them from forming complex thoughts. (Academician 4)	A4 Digital Communication's Effect on Language
Discussions on the need to rethink schooling have been prevalent since the 1990s. One must question whether children have the liberty to express thoughts freely, even if these are initially nonsensical, as a pathway to innovative thinking. Allowing children space to enjoy themselves is essential for their self-discovery. Clarity often emerges only after a period of turmoil (Academician 6)	A6 Freedom, Innovation & Student-Centered Reform
Our students understand real life. They play outside, meet with friends. Not shaped by technology. Many parents are scrap collectors or live in slums. Our school identity evolved from these student characteristics. The economic background of families defines the school's identity. (Principal 1)	P1 Socioeconomic Impact on School Identity
Parents are very supportive. They use the school space socially on weekends. They say, 'This is our school.' Their support with materials and resources directly relates to student success. (Principal 3)	P3 School as a Community Anchor
A good school leader understands what families want. The biggest issue is lack of resources financial and human. Administrative paperwork leads many to leave leadership roles. Real educational leadership is never easy. (Principal 4)	P4 Leadership Challenges and Resource Deficit
As principals & teachers, we face financial difficulties that challenge the conditions of our school, which may not sufficiently engage students. While it may be tempting to attribute these challenges to the profile of the parents, the responsibility to establish rules and foster belief in our educational mission rests with us. If we do not believe in the value of our education, how can we expect others to believe in it? (Principal 12)	P12 Leadership, Accountability in Educational Mission
Technology, lab tools, even the teacher's room are part of school identity. Even a school's external appearance shapes perceptions. Administration and surrounding neighborhood are primary factors. Teachers' alignment with management affects retention and success. (Teacher 3)	T3 Infrastructure and Administrative Compatibility
Our school is far from the center and serves low-income families, which affects our planning. Despite financial limitations, we believe school identity involves creativity, inspiration & freedom something seen more abroad. Reaching students in diverse ways is key. (Teacher 4)	T4 Low-Budget Innovation and Idealism
When I think of school identity, I first think of school administration. A principal's motivation comes from recognition, feedback from parents, even despite poor physical conditions. For teachers, seeing students understand is a major motivator. (Teacher 5)	T5 Administrative Recognition and Teacher Motivation
In my opinion, the teacher is the most important element of a school's identity. Discipline comes next. Also, being part of projects and exhibitions differentiates schools. (Student 1)	S1 Teacher as Central to School Identity
To me, teachers define the identity of a school. We chose my sibling's school based on the teacher. Good infrastructure means little if teachers aren't effective. (Student 2)	S2 Teacher Quality over Infrastructure
We need labs for history, science & a theater. Such facilities would help us learn. I'd love to join art events. I would go to school by running. (Student 5)	S5 Learning through Facilities & Engagement
School should both educate and entertain, akin to an amusement park, facilitating outdoor discussions and explorations. When home becomes monotonous, schools should offer an open door to new experiences. (Student 6)	S6 School as a space for discovery & delight beyond academics
.....	
Total	157 initial concepts

Table 3 Initial Concepts and Categories Formed through Open Coding.

Code	Initial Concepts	Nodes
C1	Sensitivity Well-being	Sensitivity (A1, A2, A4, A5, A6, A8), Happiness (A1, A4, A7, A8), Affection/Love (A1, A7, A8), Appreciation and Recognition (A1, A4)
C2	Inclusive Equitable Education	Equity and Inclusiveness (A1, A2, A3), Family Engagement (A1, A2), Feasibility and Applicability (A1, A3, A6, A7, A8), Crisis Management (A1, A3, A5)
C3	Flexibility Autonomy	Freedom and Autonomy (A1, A2, A4, A6, A7), Structural Flexibility (A1, A3, A5), Attractiveness through Extracurricular Activities (A1, A4, A6, A7, A8)
C4	Professional Capacity Empowerment	Teacher Competence (A1, A2, A3, A4, A6, A8), Openness to Change (A1, A2, A6, A7, A8), Digital Integration (A1, A2, A5, A8), Delegation and Shared Responsibility (A1, A2, A4, A6, A8)
C5	Institutional Administrative Support	Support from Higher Authorities (A1, A2, A3)
C6	Institutional Justice Belonging	Justice and Fairness (P1, P5, P6, P9, P12), Sense of Belonging (P1, P2, P12)
C7	Family Engagement Social Support	Parental Support and Contribution (P1, P2, P3, P5, P6, P7, P8, P10, P12)
C8	Professional Recognition Empowerment	Teacher Competence (P1, P2, P5, P7, P8, P12), Recognition and Appreciation (P1, P3, P5, P7, P9)
C9	Resource Management	Access to Educational Resources (P1, P3, P4, P6, P7, P9, P11, P12), Support from Upper Management (P1, P2, P5, P6, P7, P8, P10, P11)
C10	Pedagogical Design Emotional Climate	Digital Integration (P1, P2, P4, P7, P11), Emotionally Engaging Environment (P3, P5, P10, P12), Affection and School Attachment (P3, P6, P9, P12)
C11	Instructional Environment Innovation	Digital Integration (T1, T2, T3, T4, T5, T6, T8, T9, T10, T12), Differentiated Learning Environments (T1, T2, T4, T5, T6, T9, T12), Outdoor Interaction (T1, T2, T5, T6, T9, T10, T12)
C12	Professional Fulfillment Recognition	Teacher Motivation and Well-being (T1, T4, T5, T9, T12), Recognition and Appreciation (T1, T2, T3, T4, T5, T6, T7, T8, T10, T11, T12)
C13	Supportive Relationships	Parental Support (T1, T2, T5, T6, T8, T12), Support from Upper Management (T1, T2, T3, T5, T6, T7, T10, T12), Affection and Love (T1, T2, T4, T5, T9, T10, T12)
C14	Holistic Education Approaches	Extracurricular Learning Activities (T1, T2, T4, T5, T6, T7, T8, T9, T10, T12), Sense of Happiness (T1, T4, T5, T9, T12)
C15	Resource Access Autonomy	Access to Teaching Materials (T1, T2, T3, T5, T6, T9, T11, T12), Structural Flexibility (T4, T7, T12), Teacher Competence (T2, T7, T9, T12)
C16	Engagement Through Environment Nature	Interaction with Nature (S1, S3, S4, S9, S10), Varied and Comfortable Learning Environments (S1, S2, S4, S5, S6, S7, S9, S12), Physical Resource Access (S2, S10, S12)
C17	Digital Extracurricular Enrichment	Digital Integration (S1, S2, S3, S4, S6, S7), Extracurricular Activities (S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S11)
C18	Student-Centered Interests Freedom	Freedom and Student Agency (S1, S4, S6, S7, S9), Interest-Oriented Design (S1, S4, S5, S6, S7, S8, S10, S11), Choice Based on Talent and Interests (S1, S2, S5, S6, S7, S12)
C19	Supportive Relationships in Learning	Affection and Emotional Bond (S1, S4, S6, S7, S12), Family Collaboration (S1, S2, S8), Teacher Competence and Engagement (S2, S3, S4, S5, S6, S7, S8, S9, S12)
C20	Recognition Appreciation	Recognition and Encouragement (S3, S10)
C21	Equity Infrastructure Challenges	Indirect Codes: Weather-Climate Impact (S2, S3, S10), Gymnasium Access Issues, Unrealized Ideal Environments (Referenced but not coded due to frequency)

Table 4 Results of Selective Coding.

Code	Main Themes (n=21)	Sub Categories (n=54)	Initial concepts
C1	Psychosocial Flourishing	C1.1 Sensitivity	Sensitivity to psychological, social & emotional needs (A1, A2, A4, A5, A6, A8)
		C1.2 Happiness	Happy and joyful learning environments (A1, A4, A7, A8)
		C1.3 Affection/Love	Emotional bonding and warmth in school climate (A1, A7, A8)
		C1.4 Appreciation and Recognition	Recognition of educators and emotional validation (A1, A4)
C2	Equity Pedagogy	C2.1 Equity and Inclusiveness	Equal access to education regardless of background (A1, A2, A3)
		C2.2 Family involvement	Parents' active involvement in school life (A1, A2)
		C2.3 Feasibility and Applicability	Realistic planning based on field experience (A1, A3, A6, A7, A8)
		C2.4 Crisis Management	Problem-solving capacity during unexpected situations (A1, A3, A5)
C3	Professional Proficiency	C3.1 Freedom and Autonomy	Autonomy in curriculum, scheduling & learning space (A1, A2, A4, A6, A7)
		C3.2 Structural Flexibility	Flexible school models & resource use (A1, A3, A5)
		C3.3 Attractiveness through Activities	Engaging extracurricular & aesthetic features (A1, A4, A6, A7, A8)
C4	Learning Agility	C4.1 Teacher Competence	Teachers' content & pedagogical proficiency (A1, A2, A3, A4, A6, A8)
		C4.2 Openness to Change	Willingness to try new methods and innovation (A1, A2, A6, A7, A8)
		C4.3 Pedagogical Digital Adaptation	Tech adaptation for learning processes (A1, A2, A5, A8)
		C4.4 Shared Responsibility	Shared leadership among school actors (A1, A2, A4, A6, A8)
C5	Institutional Scaffolding	C5.1 Support from Higher Authorities	Institutional encouragement & structural backing (A1, A2, A3)
C6	Ethical Belonging	C6.1 Justice and Fairness	Fair treatment & ethical consistency (P1, P5, P6, P9, P12)
		C6.2 Sense of Belonging	Psychological attachment to school community (P1, P2, P12)
C7	Familial Capital	C7.1 Parental Support and Contribution	Families' academic, material & emotional contributions (P1, P2, P3, P5, P6, P7, P8, P10, P12)
C8	Teacher Dignity	C8.1 Teacher Competence	Academic & professional capacity of educators (P1, P2, P5, P7, P8, P12)
		C8.2 Institutional Acknowledgement	Value shown to school staff by leadership & families (P1, P3, P5, P7, P9)
C9	Resource Alignment	C9.1 Access to Educational Resources	Material & infrastructural needs met (P1, P3, P4, P6, P7, P9, P11, P12)
		C9.2 Technological Resource Alignment	Integration of devices & platforms into instruction (P1, P2, P4, P7, P11)
		C9.3 Support from Upper Management	External guidance & policy alignment (P1, P2, P5, P6, P7, P8, P10, P11)
C10	Affective Climate	C10.1 Emotionally Engaging Environment	Emotive learning climate & teacher-student rapport (P3, P5, P10, P12)
		C10.2 Affection and Attachment	Mutual school loyalty & interpersonal affection (P3, P6, P9, P12)
C11	Adaptive Environments	C11.1 Digital Learning Environment Design	Digital teaching innovations & engagement (T1, T2, T3, T4, T5, T6, T8, T9, T10, T12)
		C11.2 Differentiated Learning	Varied instructional settings to meet student needs (T1, T2, T4, T5, T6, T9, T12)
		C11.3 Outdoor Interaction	Environment-based or physical interaction opportunities (T1, T2, T5, T6, T9, T10, T12)
C12	Vocational Fulfillment	C12.1 Teacher Motivation and Well-being	Emotional & psychological job satisfaction (T1, T4, T5, T9, T12)
		C12.2 Professional Appreciation	External acknowledgment by colleagues or leaders (T1, T2, T3, T4, T5, T6, T7, T8, T10, T11, T12)
C13	Relational Support	C13.1 Parental Support	Parental engagement in educational progress (T1, T2, T5, T6, T8, T12)
		C13.2 Support from Upper Management	Institutional alignment with teaching staff (T1, T2, T3, T5, T6, T7, T10, T12)

C14	Holistic Schooling	C13.3 Affection and Love	Emotional care in teacher-student relationships (T1, T2, T4, T5, T9, T10, T12)
		C14.1 Extracurricular Activities	Beyond-the-classroom social learning opportunities (T1, T2, T4, T5, T6, T7, T8, T9, T10, T12)
		C14.2 Happiness	School as a source of joy&optimism (T1, T4, T5, T9, T12)
C15	Instructional Resilience	C15.1 Access to Teaching Materials	Sufficient instructional tools & supports (T1, T2, T3, T5, T6, T9, T11, T12)
		C15.2 Structural Flexibility	Flexibility in schedules&curriculum application (T4, T7, T12)
		C15.3 Teacher Competence	Skillset&expertise alignment to needs (T2, T7, T9, T12)
C16	Educational Landscapes	C16.1 Interaction with Nature	Nature-integrated & open-air learning (S1, S3, S4, S9, S10)
		C16.2 Varied & Comfortable Learning Environments	Design of physical space to encourage learning (S1, S2, S4, S5, S6, S7, S9, S12)
		C16.3 Physical Resource Access	Accessibility to facilities like labs, gyms (S2, S10, S12)
C17	Augmented Learning	C17.1 Learner–Technology Engagement	Learner-tech interface development (S1, S2, S3, S4, S6, S7)
		C17.2 Extracurricular Activities	Sports, arts & club offerings (S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S11)
C18	Personalized Pathways	C18.1 Freedom and Student Agency	Choice&autonomy in learning behaviors (S1, S4, S6, S7, S9)
		C18.2 Interest-Oriented Design	Individual learning paths&options (S1, S4, S5, S6, S7, S8, S10, S11)
		C18.3 Choice Based on Talent and Interests	Curriculum tailored to student potential (S1, S2, S5, S6, S7, S12)
C19	Relational Trust	C19.1 Affection and Emotional Bond	Trust&empathy in school culture (S1, S4, S6, S7, S12)
		C19.2 Family Collaboration	Family-school partnership ethos (S1, S2, S8)
		C19.3 Teacher Competence and Engagement	Student perception of effective teaching (S2, S3, S4, S5, S6, S7, S8, S9, S12)
C20	Affirmative Support	C20.1 Positive Reinforcement	Mechanisms fostering student motivation&peer affirmation (S3, S10)
		C20.2 Peer Affirmation	
C21	Spatial Enablers	C21.1 Climate-Compatible Learning	Learning settings adapted to weather conditions(S2, S3, S5, S10)
		C21.2 Physical Accessibility	





