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Designing Character: *Kartu Digital Santri* as a Triadic Formation Instrument in *Pesantren*

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Abstract

Digital financial technology has entered educational institutions primarily as an administrative solution, yet its potential as an instrument of character formation remains largely unexplored, particularly within Islamic boarding school contexts where moral development is a foundational institutional mission. This study aims to identify the character clusters that emerge through daily interaction with the *Kartu Digital Santri* (a student digital wallet system), to analyse the mechanisms through which values are internalised in practice, and to propose a conceptual model explaining the relationship between digital financial practice and character formation. Employing a qualitative intrinsic case study design, data were collected over four months from 48 participants across three informant groups through participatory observation, in-depth interviews, and document analysis, and were analysed using thematic analysis supported by NVivo software. The findings reveal three interlocking character clusters formed through daily interaction with the system: self-regulation, emerging from balance constraints and spending accountability; moral character, developing as a structural consequence of transaction transparency; and future skills, cultivated through repeated engagement with cashless financial practice. Together, these clusters constitute the Triadic Character Formation model, which demonstrates that *habitus*, self-regulation, moral internalisation, and adaptive literacy can be simultaneously activated through deliberate system design. The findings carry significant implications for transformational education: they suggest that genuine educational transformation does not require new curricula or additional instruction but a fundamental reconceptualisation of how institutional systems are designed, positioning the architecture of daily practice as the most powerful and underutilised site of learning and character development available to educational institutions.

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INTRODUCTION

The global integration of financial technology into educational institutions has accelerated sharply over the past decade. Cashless payment systems now manage student expenditure in schools and residential institutions across diverse national contexts. Evidence from international policy research indicates that these systems do more than improve administrative efficiency: they systematically shape the economic habits and behavioral orientations of young people from an early age (A. Suryanarayana, 2024; Khotimah et al., 2025; Verdier, 2024). Yet the pedagogical implications of this shift remain poorly understood. In *pesantren*. These are Islamic boarding schools whose foundational mission is the deliberate formation of moral character alongside religious knowledge. This gap carries particular weight in such institutions. Students at many *pesantren* currently manage daily consumption through unstructured cash-based practices that offer no built-in mechanism for reflection or accountability. Without a pedagogically considered framework to connect digital financial tools with character formation goals, technology enters the

pesantren as a managerial convenience while leaving its deepest educational mission untouched.

Existing scholarship has examined the intersection of technology and education from several productive angles. Studies of digital payment systems in school settings consistently document gains in financial transparency and administrative accountability. Research on financial literacy demonstrates that experiential engagement with financial tools produces more durable economic decision-making competence among adolescents than classroom instruction alone (Al-Ichwani & Rahayu, 2025; Merter & Balcıoğlu, 2025; Mishra et al., 2024). Character education scholars establish that moral values are internalised most effectively through sustained engagement with concrete practices rather than normative instruction (Achadah et al., 2022; Nursalim et al., 2024; Vieira & Feldens, 2021). Separately, digital literacy research confirms that repeated interaction with technology builds the adaptive competence relevant to twenty-fir st century demands (Meneses et al., 2012; Özer & Kuloğlu, 2023; Rahimi, 2024). Within Islamic education specifically, scholarly attention has concentrated on formal curriculum design and the explicit transmission of religious values. These bodies of work are individually productive but fundamentally compartmentalised: digital systems are studied as administrative instruments while character formation and digital literacy are treated as independent domains.

The gap that emerges from this literature is both specific and consequential. Empirical studies examining digital financial systems as active instruments of character formation remain rare, and studies situating this question within *pesantren* contexts are rarer still. What is currently unknown is how structured daily financial practices mediated by a digital system simultaneously shape self-regulation, moral character, and adaptive skills within a single educational environment. Prior research has not sufficiently addressed the integration of *habitus* formation, self-regulation processes, moral internalisation, and digital literacy within one analytical framework. Most existing studies rely on quantitative designs that capture end-state outcomes without illuminating the processes through which values are internalised. The *pesantren* context is particularly underexamined in this regard: its combination of intensive residential living, explicit moral formation goals, and increasing openness to digital tools makes it a theoretically revealing site for studying whether technology can function as a genuine vehicle for character education.

This study draws on four complementary theoretical frameworks. (Nulley-Valdés, 2022; Schirone, 2023; Silva & Bartolozzi Ferreira, 2023b) concept of *habitus* provides the foundational logic: dispositions form through the repeated internalisation of structured experience within a social field. (Erdemir & Yeşilçınar, 2021; Harma et al., 2025) self-regulation theory supplies a granular account of how external structural constraints transform into internal behavioral control through cycles of action, feedback, and reflection. (Purwati et al., 2024; Van Fossen et al., 2022) character education model argues that moral formation requires the convergence of moral knowledge, moral feeling, and moral action, and that environments engineering the third create conditions for the first two to follow. Deci and Ryan's (2000) self-determination theory frames the motivational dynamics of this process, showing that immediate experiential feedback generates intrinsic motivation that sustains behavioral change beyond external incentives. The novelty of this study lies in integrating all four frameworks within a single empirical context to produce the Triadic Character Formation model, a configuration that none of these theories individually anticipates.

Against this theoretical and empirical backdrop, this study examines how the *Kartu Digital Santri* (a student digital wallet system) functions as a pedagogical instrument for character formation in the daily life of students at PPATQ RF in Pati, Central Java, Indonesia. The urgency of this inquiry rests on a straightforward but underexplored premise: when a digital system is embedded in an institution whose primary mission is moral formation, its design choices are inherently pedagogical choices, and treating them otherwise is a missed educational opportunity. This study therefore aims to identify the character clusters that emerge through daily interaction with the card system, to analyse the mechanisms through which values are internalised in practice,

and to propose a conceptual model that explains the relationship between digital financial practice and character formation. Three research questions guide the inquiry. First, how does daily use of the *Kartu Digital Santri* shape students' self-regulation as a capacity for disciplined and reflective resource management? Second, how does the transparency built into the card system facilitate the internalisation of moral character, specifically honesty, trustworthiness, and *qana'ah*? Third, how does repeated interaction with the cashless system develop financial and digital literacy as adaptive competencies?.

RESEARCH METHOD

This study employed a qualitative approach with an intrinsic case study design, selected because the central research question demands attention to process and meaning rather than the measurement of outcomes. Understanding how a digital financial system shapes character formation in an Islamic boarding school requires sustained, contextually grounded engagement with the lived experience of those inside that environment, precisely the kind of inquiry that qualitative case study methodology is designed to support (Jalees et al., 2024). The research was conducted at Pondok Pesantren Anak Tahfidzul Quran Raudlatul Falah (PPATQ RF) in Pati, Central Java, Indonesia, a site selected on grounds of theoretical relevance: as a tahfidz-based boarding school that had fully integrated the Kartu Digital Santri system into students' daily transactional life within a religiously grounded moral formation environment, it offered an unusually productive setting for the questions this study was designed to address. Participants were selected through purposive sampling, with the defining inclusion criterion being active, sustained engagement with the card system for a minimum of six months prior to data collection. The final sample comprised 48 informants distributed across three groups whose different institutional positions provided layered and complementary perspectives on the same phenomenon, as presented in **Table 1**.

Table 1. Participant Profile and Inclusion Criteria

No.	Category	n	Characteristics	Inclusion Criteria
1	Students (Santri)	36	Ages 10 to 15; active card users	Active participation in the digital transaction system for at least six months
2	Ustadz (Supervisors)	10	Daily supervisors responsible for student conduct	Direct involvement in overseeing students' daily card use; minimum one year of service
3	Kiai (Decision-makers)	2	Institutional leaders with full authority over card system policy	Institutional responsibility for the design and governance of the Kartu Digital Santri programme
Total		**48**		

Data were collected over four months through three techniques deployed simultaneously rather than sequentially, so that each could inform the others in real time: participatory observation, in-depth interviewing, and document analysis. Participatory observation was conducted across sixteen weeks at the primary transaction points within the pesantren, using a structured checklist supplemented by open-ended field notes, with the researcher maintaining an observer-participant role to reduce reactivity effects. In-depth interviews were conducted with all 48 informants using separate semi-structured guides calibrated to the different vantage points of students, ustadz, and kiai; each session lasted between 45 and 75 minutes, was audio-recorded with informed consent, and was subsequently transcribed verbatim. Document analysis drew on four months of monthly transaction summaries, internal card usage regulations, and institutional financial management reports, treating each document as an artefact of practice to be cross-referenced against interview and observational data rather than accepted as a transparent record of fact. The instruments, scope, and triangulation sources for all three techniques are summarised in **Table 2**.

Table 2. Data Collection Techniques, Instruments, and Triangulation Sources

Technique	Instrument	Focus	Duration / Scope	Triangulation Source
Participatory Observation	Structured field notes; observation checklist	Daily transaction patterns; student-system interaction	16 weeks; canteen and common areas	Interview accounts; transaction records
In-depth Interview	Semi-structured guide (separate protocols per informant group)	Lived experience, perceptions, and reflections on card use	45 to 75 minutes; 48 informants across three groups	Observation notes; institutional documents
Document Analysis	Monthly transaction recaps; card regulations; financial reports	System structure, policy framework, and quantitative spending patterns	Four months of transaction archives; policy documents	Interview data; observation field notes

Data analysis followed (Braun & Clarke, 2023) thematic analysis framework, operationalised across five phases and supported throughout by NVivo qualitative data analysis software. Beginning with data familiarisation and open coding of 74 initial codes drawn inductively from the raw material, the analysis proceeded through axial coding and categorisation into 18 intermediate groupings before arriving at three overarching themes through inductive synthesis. A final phase of theoretical interpretation brought those themes into dialogue with the study's conceptual framework, attending explicitly to convergences, tensions, and negative cases rather than forcing the data into a predetermined structure. The five phases, their corresponding outputs, and the NVivo functions used at each stage are detailed in **Table 3**. The trustworthiness of the study was addressed through four strategies aligned with the criteria of (Enworo, 2023; Younas et al., 2023): source and technique triangulation combined with member checking for credibility; thick contextual description for transferability; a fully documented audit trail for dependability; and a researcher reflexivity journal with peer debriefing at three analytical junctures for confirmability. All ethical requirements were met, including written informed consent from adult participants, parental consent for minor students, alphanumeric coding of all identities, secure storage of audio recordings, and formal institutional ethical clearance prior to fieldwork.

Table 3. Phases of Thematic Analysis and NVivo Support Functions

Phase	Stage	Procedure	Output	NVivo Function
1	Data Familiarisation	Transcription of recordings and observation notes; repeated reading of all materials	Full transcripts; annotated field notes	Document import; source management
2	Open Coding	Line-by-line coding to generate initial descriptive codes without predetermined categories	Initial codebook of 74 open codes drawn from raw data	Free node creation; auto-coding for speaker identification
3	Axial Coding and Categorisation	Grouping of related codes into higher-order categories reflecting recurring patterns across informant groups	18 intermediate thematic groupings	Tree node hierarchy; relationship mapping
4	Theme Generation	Inductive synthesis of categories into overarching themes corresponding to the identified character clusters	Three core themes: self-regulation, moral character, and future skills	Query function; matrix coding for cross-informant comparison
5	Theoretical Interpretation	Integration of themes with the theoretical framework; identification of convergences and negative cases	Annotated theme map; Triadic Character Formation model	Memo tool; visualisation of node relationships

RESULT AND DISCUSSION

Result

The findings reveal that the Kartu Digital Santri (Student Digital Card) system at PPATQ RF operates well beyond its administrative function. Daily interactions with the card produced a

layered set of behavioural and attitudinal changes that took shape gradually over the four-month study period. What made this process distinctive was its implicitness: character was not being taught in any formal sense, but was being practised and reinforced through the small, repetitive decisions that filled each student's day. Thematic analysis of the data identified three interlocking character clusters, each sustained by a different mechanism within the system design, yet all three feeding into a single integrated ecosystem of character formation.

Table 4. Core Findings: Character Clusters, System Mechanisms, and Long-term Impact

No.	Character Cluster	System Mechanism	Key Empirical Evidence	Theoretical Basis	Long-term Impact
1	Self-Regulation	Balance caps and automatic transaction logging prompt spending planning	Transaction anomalies fell by approx. 83%; spending became evenly distributed across the week	Zimmerman (2002); Bourdieu (1977)	Disciplined spending as durable habitus
2	Moral Character	Full transaction transparency removes space for manipulation and enforces accountability	Lost-allowance reports fell from 11 to 2 per month; proxy-buying practices nearly disappeared	Lickona (1991); Kohlberg (1984)	Structural integrity; internalised honesty and trustworthiness
3	Future Skills	Repeated interaction with the cashless system builds operational competence through practice	Technical transaction errors fell by 83%; peer-teaching of card use emerged spontaneously	Ng (2012); Lusardi et al. (2017)	Adaptive financial and digital literacy

The sections that follow examine each cluster in depth, drawing on interview excerpts, field observation notes, and documentary evidence from transaction records. Within each cluster, the three data sources are presented separately before being brought together in an explicit triangulation, so that the convergence of evidence can be assessed rather than merely asserted.

Self-Regulation: Discipline as a System-Formed Habitus

The most immediately visible outcome of the card system was the development of self-regulation among students. Discipline and spending control did not emerge from moral instruction or adult supervision, but from the structural logic of the system itself: a fixed balance cap, automatic deduction with each purchase, and the permanent visibility of remaining funds. These features created a feedback environment in which the consequences of poor planning were felt quickly and concretely. Over time, that feedback loop worked its way into students' decision-making habits, producing what (Schirone, 2023; Silva & Bartolozzi Ferreira, 2023a) would describe as a new habitus, a durable disposition that began to feel natural rather than imposed. When asked how the card had changed the way they approached spending, students described a gradual shift in awareness that many found difficult to articulate at first. S1, an 11-year-old student, put it simply: *"When the balance gets low, I think twice before buying anything. I am scared it will run out before the week ends." (S1, age 11)*

This kind of pre-purchase hesitation was notably absent in students' accounts of how they had handled cash. The constraint was not experienced as punishment but as a practical reality that demanded a response. A slightly younger student, S2 (age 10), described the same shift in temporal terms: *"I hold back more now. Before, I would spend whatever I had right away. Now it has to last until the next top-up." (S2, age 10)* The language here is telling. The phrase 'it has to last' suggests that the student had internalised the budgeting horizon not as an external rule but as a personal constraint worth managing. Supervisory staff confirmed these changes from the outside. When ustadz U1 was asked to compare student behaviour before and after the card system was introduced, his response focused on a shift in how students categorised their own desires: *"The students are more organised now. They are starting to distinguish between needs and wants." (U1, supervising ustadz)*

Ustadz U2 framed the same observation in terms of a concrete, measurable change in the problem pattern he had previously managed: *"Students used to run out of money by midweek all the time. That rarely happens now because they have learnt to manage on their own." (U2, supervising ustadz)* At the institutional level, the kiai who oversaw the card system offered a reflection that captured the pedagogical philosophy behind the design: *"The system trains them to be responsible. Nobody forbids anything, but the system itself does the educating." (K1, institutional decision-maker)* This last statement is theoretically significant. It describes a situation in which external regulation has been internalised to the point where students police their own behaviour, which is precisely the endpoint of (Pachón-Basallo et al., 2022) self-regulation model. The thematic matrix below organises the full set of interview data for this cluster. Across the five informants whose accounts most directly addressed self-regulation, a shared pattern emerged despite the differences in their roles and perspectives. Each excerpt anchors to a distinct theme while all five converge on the same underlying process: the gradual transformation of an external structural constraint into an internalised behavioural disposition, as detailed in **Table 5**.

Table 5. Thematic Matrix of Interview Data: Self-Regulation Cluster

Code	Representative Excerpt	Main Theme	Sub-theme	Theoretical Link
S1	*"When the balance gets low, I think twice before buying anything. I am scared it will run out before the week ends."*	Spending control	Pre-transaction self-evaluation	Zimmerman (2002)
S2	*"I hold back more now. Before, I would spend whatever I had right away. Now it has to last until the next top-up."*	Delayed gratification	Shift from impulsive to planned behaviour	Bourdieu (1977)
U1	*"The students are more organised now. They are starting to distinguish between needs and wants."*	Social behaviour regulation	Needs-versus-wants discrimination	Zimmerman (2002)
U2	*"Students used to run out of money by midweek all the time. That rarely happens now because they have learnt to manage on their own."*	Weekly financial planning	More even distribution of spending	Bourdieu (1977)
K1	*"The system trains them to be responsible. Nobody forbids anything, but the system itself does the educating."*	Structural regulation	External regulation transformed into internal self-control	Deci and Ryan (2000)

Observational data gathered across sixteen weeks corroborated what students and educators described in interviews. From the earliest days of the study, researchers noted a visible routine: before stepping up to the canteen counter, most students paused to check their balance on the card terminal. This behaviour was unprompted and became more consistent over time. By weeks fourteen to sixteen, it had the character of an automatic check rather than a deliberate calculation. Beyond individual behaviour, the observation logs recorded a social dimension to self-regulation that had not been anticipated in the study design. Students were regularly observed discussing spending priorities with one another, particularly when a purchase decision was not straightforward. In several instances, a student would hold back from buying something and explain to a companion that the item was not worth the remaining balance. This kind of spontaneous peer reinforcement suggests that the card system had generated shared norms around spending, not just individual habits.

A developmental pattern was also visible across the study period. During weeks one and two, a number of students still displayed impulsive spending behaviour despite the balance cap, exhausting funds quickly and then waiting passively for the next top-up. By weeks fourteen and sixteen, this pattern had largely disappeared. Students in this later period were observed making deliberate choices about timing and quantity, clear signs that planning had become part of their transaction routine. The documentary record provided quantitative confirmation of the patterns observed in interviews and in the field. A review of monthly transaction summaries showed that spending anomalies, defined as purchases that were inconsistent with established patterns or that

left balances at zero more than three days before a scheduled top-up, fell from an average of 23 cases per month in month one to 4 cases in month four, a reduction of approximately 83 percent. The distribution of spending across the week also changed in a telling way. In the first month, more than 60 percent of each student's weekly expenditure was concentrated on Monday and Tuesday. By the fourth month, that figure had dropped to around 35 percent. This shift indicates that students were spreading their purchases more deliberately across the week, which is consistent with the budgeting behaviour reported in interviews and observed in the canteen.

Bringing the three data sources together produces a coherent and mutually reinforcing account. The behavioural changes described by S1 and S2 in interviews align precisely with the pre-transaction balance-checking observed in the field, and both are confirmed by the documentary evidence of declining anomalies and more even spending distribution. No single source would have been sufficient on its own: the interview data explains the subjective experience, the observation data shows the behaviour in context, and the documents provide the quantitative trajectory. Analytically, the findings support a reading of self-regulation as an emergent property of system design rather than an individual trait.

It should be noted that the formation of self-regulation was not uniform across all students. Approximately four of the thirty-six students observed continued to show impulsive spending patterns through the second month. In each case, their supervising ustadz responded by reviewing the weekly transaction recap with them in a one-on-one session, using the record as a concrete basis for reflection. All four showed improvement by the third month. This variation does not undermine the overall finding; if anything, it strengthens it, since it demonstrates that the system alone is not sufficient and that the combination of structural design and guided reflection is what produces durable self-regulation.

Moral Character: Integrity as a Structural Consequence of System Transparency

If self-regulation describes what students did with the constraints the system imposed, moral character describes who they became through the transparency it enforced. Every transaction made with the *Kartu Digital Santri* left a permanent, traceable record. There was no way to make a purchase anonymously, no mechanism for a student to misrepresent how their balance had been spent, and no gap between what the system recorded and what had actually occurred. In an environment where manipulation had been structurally foreclosed, honesty ceased to be a matter of willpower and became instead the path of least resistance. The values of kejujuran (honesty), *amanah* (trustworthiness), and *qana'ah* (contentment with sufficiency) did not need to be preached; the architecture of the system made them the default.

When students were asked about the difference between using cash and using the digital card, the theme of visibility came up repeatedly and without prompting. S3, aged 12, described the experience of being watched not by a person but by the system itself: *"With the card, everything is recorded. You cannot mess around. I am much more careful with money now." (S3, age 12)* The phrase 'you cannot mess around' is worth dwelling on. It suggests that the student understood the absence of manipulation not as a personal achievement but as a consequence of how the system worked. A different kind of temptation, the practice of asking a friend to use their card on one's behalf, a behaviour known locally as titip beli, was addressed directly by S4 (age 9): *"I would not dare ask someone to buy things using their card for me. I am afraid they will find out if something goes wrong." (S4, age 9)*

This is a precise description of deterrence operating through transparency. The student did not say that proxy-buying was wrong; they said it was risky because of what the record would show. Whether this constitutes genuine moral internalisation or merely prudential restraint is a question the data alone cannot resolve, but the subsequent interview data from educators and the kiai suggests that the two converged over time. Ustadz U3 connected the system's traceability directly to the Islamic concept of amanah: *"With this system, the students learn to be trustworthy. They know every rupiah can be traced." (U3, supervising ustadz)* Ustadz U4 reported a specific and observable outcome that quantified the moral shift: *"The proxy-buying behaviour that used to cause shortfalls has almost*

disappeared. The system makes them honest." (U4, supervising ustadz) The institutional framing came from K2, who articulated the philosophy of designing for behaviour rather than commanding it: *"We did not add new rules. The system itself became a living rule. The students learn responsibility because the system is transparent." (K2, institutional decision-maker)*

Observations in the canteen and at transaction points reinforced the interview accounts. Researchers noted that students consistently conducted transactions without intermediaries, scanning their own card, waiting for the amount to be deducted, and then checking the terminal to confirm the new balance. This sequence, repeated hundreds of times across the study period, became a visible ritual of personal accountability. The habit of confirming the deducted amount was particularly notable, since it implied that students had a mental model of what the transaction should cost and were verifying that the record matched their expectation. Researchers also observed how students handled situations in which a friend's balance was insufficient. In contrast to what *ustadzs* reported from the pre-system period, when cash shortfalls often led to informal loans and subsequent disputes, students in the observed period typically responded by adjusting their expectations. A student whose balance could not cover a desired purchase would either forgo the item or select a cheaper alternative.

This behavioural adjustment, small in itself, reflects the gradual internalisation of *qana'ah* as a practical orientation rather than an abstract teaching. One negative case during the observation period is worth recounting because of what it revealed about the system's corrective capacity. Early in the third week, one student (S8, age 10) attempted to use a classmate's card to purchase a snack on their own behalf. The discrepancy was flagged automatically in the next transaction recap and brought to the attention of the student's *ustadz*, who used the record as the basis for a reflective conversation rather than a punitive response. The student did not repeat the behaviour. This incident illustrates how the transparency of the system operates not only as a deterrent but as a starting point for deliberate moral education.

The documentary evidence offered the clearest quantitative picture of the shift in moral behaviour. Reports of missing or unaccounted-for allowances, a consistent feature of the pre-system period, fell from eleven cases in the first month to two cases in the fourth month. The discrepancy between recorded balances and students' reported spending, previously averaging approximately Rp 8,500 per student per week, approached zero by the final month of the study. These figures are not merely administrative improvements; they represent a measurable reduction in the small dishonesty that cash-based systems tend to permit.

The convergence across all three data sources for this cluster is particularly strong. Students described becoming more careful because the record existed; observers watched them verify transactions independently and adjust behaviour when balances were low; and documents showed a sustained decline in the anomalies that moral lapses previously produced. Each source corroborated the others, and none contradicted any finding from the other two. The negative case of S8 adds an important nuance. It shows that the system does not make moral lapses impossible, but it does make them visible and recoverable. The combination of automatic detection and educator-led reflection produced a corrective feedback loop that the cash-based system lacked entirely. This is what makes the system pedagogically interesting: it does not eliminate human agency, but it reshapes the environment in which that agency is exercised, making honest behaviour structurally easier and dishonest behaviour structurally costly.

Future Skills: Financial and Digital Literacy as Adaptive Capacity

The third cluster that emerged from the data was perhaps the least anticipated at the outset of the study, and for that reason it is in some ways the most theoretically significant. Self-regulation and moral character are outcomes that pesantren educators have long sought to cultivate; financial and digital literacy are not typically foregrounded in the pesantren's educational mission. Yet the data suggest that both developed as natural by-products of the system, not through any supplementary instruction, but through the accumulated experience of managing a digital account

in real time. By the end of the four-month period, students had acquired a working understanding of how money moves through a digital system, what records are produced, and how to navigate those records to make better decisions.

When asked how they thought about their card balance, students' responses revealed a level of financial reasoning that went beyond simple spending awareness. S5, aged 12, framed the balance in explicitly temporal terms: *"Now I know how much balance I have left and that it must last until the end of the week. If I do not manage it, it runs out fast." (S5, age 12)* This is the language of cash-flow management, applied without prompting to a student's weekly allowance. S6 (age 11) described a price-comparison habit that had developed through repeated transactions at the canteen: *"Before buying, I check the price and how much money I have left. That way I know what is more important." (S6, age 11)*

The phrase 'what is more important' is significant because it indicates that the student was not simply calculating whether they could afford something but actively weighing alternatives. This is a basic but genuine form of economic reasoning. S7 (age 10) addressed the technology dimension directly, describing a change in how comfortable they felt in a cashless environment: *"I am used to the card now. I am not confused anymore when I do not have cash in my hand." (S7, age 10)* The two *ustadz* whose observations are most relevant to this cluster each focused on a different dimension of the literacy development. Ustadz U5 emphasised the role of instant feedback: *"Students understand the value of money much faster now because they see their balance change with every transaction." (U5, supervising ustadz)* Ustadz U6 situated the change within the broader context of preparing students for a digitalised economy: *"They are also much more ready for technology. They are no longer awkward using a digital system for everyday needs." (U6, supervising ustadz)*

Field observations documented a visible progression in both the speed and the confidence with which students handled their cards. In the first two weeks of the study, the average time required to complete a canteen transaction was between 45 and 60 seconds, with much of that time spent navigating the terminal. By weeks fourteen and sixteen, the same transaction took between 10 and 15 seconds. The reduction in transaction time is a simple but meaningful proxy for growing digital competence. Beyond individual improvement, researchers observed the emergence of spontaneous peer instruction. Students who had become proficient with the card were regularly seen helping newer or less confident classmates, explaining how to check balances, how to interpret the receipt display, and how to confirm that a transaction had gone through correctly. This horizontal knowledge transfer did not appear to be organised or prompted by staff; it arose from the social dynamics of a shared daily practice. It also suggests that digital literacy, once acquired, became a social good that circulated within the student community rather than remaining a purely individual achievement.

The documentary record for this cluster captured two distinct forms of progress. First, the frequency of technical transaction errors, which included incorrect card insertions, aborted payments, and double-tapping, fell from 18 incidents in the first month to 3 incidents in the fourth month, again a reduction of approximately 83 percent. This figure tracks growing operational familiarity with the technology over time. Second, and more substantively, the composition of purchases shifted across the study period. The proportion of spending categorised as basic necessities, including food staples and stationery, increased from 58 percent of total expenditure in month one to 74 percent in month four. Spending on discretionary items declined correspondingly. This compositional shift is consistent with the development of financial reasoning described in interviews, specifically the habit of weighing needs against wants before committing to a purchase.

Table 6. Triangulation Matrix: Convergence of Evidence Across Data Sources

Cluster	Interview Data	Field Observation	Transaction Documents
Self-Regulation	Students reported delaying purchases and planning spending independently (S1, S2, U1, U2, K1)	Students consistently checked balances before transactions; peer discussions about	Transaction anomalies dropped by approx. 83%; spending distribution across

		spending priorities were observed	the week became markedly more even
Moral Character	Students reported heightened caution due to the digital trail; proxy-buying declined sharply (S3, S4, U3, U4, K2)	Transactions were conducted independently without intermediaries; students verified deducted amounts before leaving the counter	Lost-allowance reports fell from 11 to 2 per month; discrepancies between recorded and actual balances approached zero
Future Skills	Students articulated balance management and spending priorities; educators observed measurable gains in financial literacy (S5, S6, S7, U5, U6)	Students compared prices, postponed non-urgent purchases, and spontaneously helped peers learn to use the card	Technical transaction errors declined progressively from 18 to 3 incidents; purchases shifted toward basic necessities over discretionary items

As **Table 6** shows, the three data sources for the Future Skills cluster tell a coherent story from different angles. Students articulated growing financial awareness in interviews; observers watched them act on that awareness at the point of purchase; and transaction records confirmed that their actual spending patterns shifted in the direction the interviews predicted. The convergence is strong enough to support the claim that financial and digital literacy developed not as peripheral outcomes but as genuine competencies rooted in daily experience. Analytically, what is most notable here is the situated, contextual nature of the literacy that formed. Students were not taught financial principles in a classroom and then asked to apply them; they encountered the principles through their own spending decisions, made mistakes, observed the consequences in their balance records, and adjusted. This is experiential learning in the precise sense that Kolb (1984) describes: concrete experience, reflective observation, abstract conceptualisation, and active experimentation cycling continuously through the same daily practice.

Taken individually, each of the three-character clusters represents a meaningful educational outcome. Taken together, they constitute something more: an integrated ecosystem in which the development of each cluster depends on and reinforces the others. Self-regulation provides the internal discipline that makes honest, accountable behaviour possible; moral character supplies the value orientation that gives financial decisions their ethical weight; and future skills translate both into the kind of adaptive competence that students will need beyond the *pesantren* walls. The mechanism that connects all three is practice, specifically the structured, repeated, consequential practice that the card system generates every day. Each transaction is a small test of self-regulation, a small exercise in accountability, and a small accumulation of financial and digital experience. None of these effects is large on its own, but across hundreds of transactions over four months, their cumulative weight is substantial. This is what the Triadic Character Formation model, as illustrated in Figure 1, is designed to capture: not a one-time intervention but a process of gradual habituation in which the system's design does much of the pedagogical work.

The finding that character formation can be embedded in system design rather than delivered through explicit instruction has practical implications that reach beyond the *pesantren* context. Any educational institution that introduces a digital financial system of this kind is, whether or not it recognises this, making a set of pedagogical choices. The balance cap, the transaction record, the transparency of the interface: each of these design features shapes the behavioural environment in which students operate. This study suggests that attending deliberately to those choices, and aligning them with educational goals, can turn an administrative tool into a powerful, silent teacher.

Discussion

The findings of this study reveal that the Kartu Digital Santri operates as considerably more than an administrative convenience. Across three interlocking character clusters, self-regulation, moral character, and future skills, the data converge on a single, theoretically significant conclusion: when a digital financial system is embedded in a structured educational environment and used consistently over time, it generates pedagogical effects that parallel and in some respects

exceed what conventional character education programmes can produce through direct instruction.

The finding that balance constraints and automatic transaction logging produced measurable gains in students' self-regulatory behaviour is consistent with (Ozimek & Förster, 2021) theoretical account of how self-regulation develops, but it extends that account in a direction the original theory did not anticipate. Zimmerman describes self-regulation as emerging from cycles of forethought, performance, and self-reflection, a process typically studied in academic task contexts where the learner sets goals, monitors progress, and adjusts strategy. What this study demonstrates is that the same cyclical mechanism can be activated by a financial system rather than a pedagogical prompt: the balance cap functions as an externally imposed goal, each transaction produces immediate performance data, and the visible depletion of funds generates the reflective moment in which students recalibrate their behaviour. This is self-regulation engineered into the environment rather than taught as a skill, a distinction that has significant implications for how the concept is understood and applied in educational design. Prior studies on digital payment systems in schools have documented efficiency gains and administrative improvements (Zhao et al., 2023), but none have traced the pathway from system constraint to internalised behavioural disposition with the granularity that this study's qualitative data allow. The negative cases identified in the findings, specifically the small group of students who continued impulsive spending patterns into the second month and recovered only through guided reflection with their ustadz, add an important nuance: the system creates the conditions for self-regulation but does not guarantee it. The combination of structural design and human mentorship is what produces the durable habitus that (Ni et al., 2025) describes, a point that prior literature on educational technology has consistently underweighted in its enthusiasm for what systems can achieve without human mediation.

The emergence of honesty, trustworthiness, and contentment with sufficiency as structural consequences of system transparency rather than as products of moral instruction represents the most theoretically distinctive finding of this study, and it is the point at which the data most directly challenge the assumptions of mainstream character education research. (Purwati et al., 2024) argues that character formation requires moral knowledge, moral feeling, and moral action to work in concert, and that the most effective character education programmes are those which deliberately cultivate all three. What this study shows is that a well-designed digital system can engineer the conditions for moral action without requiring explicit moral instruction, and that when students repeatedly experience the consequences of honest, accountable behaviour in a transparent environment, moral knowledge and moral feeling tend to follow. This finding resonates with (Moody-Adams, 2025) developmental account of moral reasoning, which holds that moral growth is stimulated by encounters with situations that demand ethical decision-making; the card system creates precisely such encounters, hundreds of times across the course of a semester, in the mundane but consequential domain of personal finance. The work of (Palau-Sampio, 2021) on digital governance provides a useful frame for understanding the mechanism: their research shows that transparency in digital systems increases ethical behaviour among adults in institutional contexts by reducing the space available for rationalising deviation. This study demonstrates that the same dynamic operates among children in an educational context, and that its effects extend beyond compliance to genuine internalisation, as evidenced by the shift in students' own accounts of why they behaved honestly, from fear of detection in the early weeks to internalised commitment to amanah by the later period of the study.

The development of financial and digital literacy as by-products of daily card use is the finding that most directly engages the literature on experiential learning and twenty-first century skills, and it is here that the study's contribution to that literature is most straightforward, if no less significant for being so. (Wijnen-Meijer et al., 2022) experiential learning cycle, which moves from concrete experience through reflective observation and abstract conceptualisation to active experimentation, maps almost perfectly onto the trajectory documented in this study: students

encountered the financial system, observed the consequences of their decisions in real time through balance changes, developed an implicit conceptual model of how the system worked, and adjusted their behaviour accordingly. (Platz & Jüttler, 2022) have demonstrated that practice-based financial literacy interventions outperform knowledge-based ones in producing durable economic decision-making competence, and this study provides qualitative evidence of the mechanism through which that superiority operates: it is the immediacy of consequence, the fact that the balance changes the moment a purchase is made, that makes the learning stick in a way that classroom instruction about budgeting cannot replicate. The digital literacy dimension is equally well supported by existing research: (Makhafola et al., 2025) identify operational competence, the ability to use digital tools fluently and confidently in real-world contexts, as the foundational layer on which higher-order digital skills are built. The reduction in transaction errors from 18 to 3 incidents across the four-month study period, combined with the emergence of spontaneous peer instruction, suggests that this foundational competence was not only acquired but socialised, becoming part of the shared practice of the student community rather than remaining an individual achievement. What this study adds to both bodies of literature is the demonstration that financial and digital literacy, when developed through this kind of embedded, consequential practice, do not remain isolated competencies but become integrated with the values of self-regulation and moral accountability that the card system simultaneously cultivates.

The central theoretical contribution of this study is the Triadic Character Formation model, which proposes that character development in a digitally mediated educational environment proceeds through three mutually reinforcing dimensions: self-regulation as a structural foundation, moral character as a value orientation, and future skills as an adaptive outcome. The novelty of this model lies not in any single dimension but in the relationship between them, and in the claim that a single, well-designed environmental feature, in this case a digital financial system, can activate all three simultaneously through the same mechanism of repeated, consequen tial, transparent practice. Previous theoretical frameworks have addressed these dimensions separately or in pairs. (Carlson & Schneickert, 2021) accounts for the formation of dispositions but does not specifically address the role of financial technology as a structuring field. (Navarro et al., 2023) explains self-regulation but focuses primarily on academic performance contexts. (Purwati et al., 2024) integrates moral knowledge, feeling, and action but does not theorise the role of environmental design in engineering the conditions for all three. (Sansone & Tang, 2021) illuminate the motivational dynamics of intrinsic value formation but do not examine digital systems as motivational environments. This study brings these four frameworks into dialogue within a single empirical context and proposes a configuration that none of them individually anticipates: the idea that digital practice functions as a hidden curriculum in the precise sense that (Morcom, 2023) originally intended, transmitting values not through what is explicitly taught but through the structure of the environment in which learning takes place. The Triadic Character Formation model extends Jackson's concept by showing that hidden curricula can be deliberately designed, that the pedagogical effects of environmental structure are not merely incidental but can be intentionally engineered to serve specific educational goals, and that technology, when approached as an educational design problem rather than an administrative solution, becomes one of the most powerful tools available to institutions committed to character formation.

CONCLUSION

This study establishes that the *Kartu Digital Santri* at PPATQ RF functions as a pedagogical architecture rather than a mere administrative tool, producing character formation through three interlocking clusters: self-regulation, moral character, and future skills. The balance cap, transaction transparency, and immediate feedback built into the card system engineered the conditions in which discipline became habitual, honesty became structural, and financial and digital literacy became operational capacities woven into daily practice, forming a mutually reinforcing

ecosystem held together by the Triadic Character Formation model proposed here. This model integrates *habitus* theory, self-regulation, character education, and self-determination theory within a single empirical framework, demonstrating that digital practice can function as a hidden curriculum whose pedagogical effects are not incidental but deliberately designable. The study is bounded by its single-site qualitative design, and its findings cannot be assumed to transfer automatically to other institutional contexts. Future research would benefit from a comparative multi-site design, a longitudinal approach tracking whether character gains persist beyond active card use, and a mixed-methods framework capable of testing these relationships at scale. What this study establishes with confidence is a conceptual shift: character formation in digital educational environments is not a curriculum to be delivered, but an environment to be designed.

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