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Ethically Oriented Gamification Mechanisms in Family Digital Platforms: The Influence of Positive Reinforcement Systems on the Formation of Healthy Digital Habits in Children

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Abstract- This study analyzes gamified systems as a structural component of contemporary family digital platforms in 2024–2025. At the center of the discussion lies the problem of ethically sound design of game mechanics functionally oriented toward the formation of sustainable and psychologically healthy digital practices among children and adolescents. The analytical corpus of the study includes an interpretation of screen-time statistics and device-use patterns, an assessment of the dynamics of the EdTech segment, and an examination of behavioral models applicable to habit regulation, including B. J. Fogg's model and optimized Markov decision processes as an instrument for formalizing sequences of choice and probabilistic transitions.

It is shown that the effectiveness of gamification is determined not by decorative "playification" of the interface, but by the proper calibration of feedback loops and reinforcement contingencies. Within this context, the mechanisms of positive reinforcement are examined, and two logics of influence are compared: automated gamification, which delivers algorithmically specified stimuli, and traditional parental praise as a socially mediated form of reinforcement marked by a different valence and a different degree of contextual sensitivity. It is emphasized separately that the transfer of motivational regulation functions into a software environment increases the reproducibility of the effect, yet simultaneously intensifies the requirements for transparency and controllability of design, since an error in the calibration of reinforcement may consolidate non-target behavioral strategies.

A substantial analytical block is devoted to "dark patterns" as a class of design decisions aimed at the covert intensification of engagement and retention through the exploitation of vulnerabilities in cognitive control. These practices are considered not merely as a violation of user autonomy, but also as a source of long-term risks for the family environment, since they transform the platform from an instrument of support into a mechanism of coercion and dependent use. As a countermeasure, ethical design frameworks are formulated and conceptually correlated with the normative principles of UNICEF and the OECD, where priority is assigned to well-being, the protection of minors, the exclusion of manipulative stimuli, and the provision of verifiable fairness toward child audiences.

The results demonstrate that scientifically grounded gamification statistically and behaviorally increases the frequency of target actions in a noticeable manner; however, the durability of the effect proves limited when external stimuli dominate. A critical need is identified for the inclusion of identity-support mechanisms that ensure the internal consolidation of motivation and prevent behavioral rollback after reinforcement is withdrawn. In this way, gamification is interpreted as a means of initiating and stabilizing practice, though not as a self-sufficient source of long-term self-regulation.

At the applied level, the study offers recommendations for the design of family task systems oriented toward long-term outcomes, in which game mechanics remain subordinate to the goals of digital well-being rather than to retention metrics. Particular emphasis is placed on designing such interaction loops as support autonomy, predictability, and psychological safety while preserving motivational effectiveness without shifting into manipulative architectures.

Keywords: gamification, family digital platforms, positive reinforcement, behavioral design, digital well-being, healthy habits, EdTech 2025, IT ethics, psychological needs.

Introduction

By the middle of the third decade of the twenty-first century, the digital environment had become firmly established as a foundational framework of children's socialization and development, including even the earliest age groups. Everyday practices modified by mobile devices and intelligent platforms have moved close to a threshold condition in both scale and intensity: according to 2025 data, approximately 68% of children aged 3–17 demonstrate active engagement with social media and digital applications [1]. The representative character of this involvement is illustrated by the situation in the United Kingdom, where more than 814,000 children aged 3–5 are reported to use online platforms regularly despite formally established age restrictions [1]. In the 13–17 age group, activity reaches 95%, with daily device use serving as the dominant mode, as reported by an overwhelming majority of adolescents [1].

This configuration has produced a shift in analytical focus: instead of the simplified logic of "time limits," there emerges a need for more substantive models of governing digital relations. In 2025, parental strategies are embedded in the necessity of maintaining a delicate balance between the educational potential of technology and the risks associated with dependency formation, sleep disruption, and emotional lability [2]. A substantial proportion of parents (49%) indicate reliance on screen time as an instrument of behavioral control or as a functional substitute for unavailable childcare services [2]. At the same time, 60% of parents report feelings of guilt, observing the displacement of high-quality forms of family interaction by technology [2]. This reflects not merely a private psychological discomfort, but a systemic tension between the convenience of digital practices and the value of interpersonal closeness.

Within this context, gamification, understood as the transfer of game design elements into non-game scenarios, acquires the status not of an entertaining supplement, but of a strategic instrument for habit formation. The economic dynamics of the sector confirm the institutionalization of this approach: by 2024, the global gamification-in-education market was valued at USD 3.5 billion, while projected growth to USD 14.3 billion by 2030 is accompanied by a compound annual growth rate of 26.6% [3]. Yet the large-scale implementation of game mechanics naturally strengthens the demand for ethical evaluation, since designs that support a child's autonomy differ in principle from manipulative architectures oriented toward maximizing time on platform within a logic of advertising monetization.

The design of family task systems requires not a declarative but an operationalized understanding of positive reinforcement. Studies published in 2024 show that parental praise, while retaining significance as a socially saturated form of support, in some cases yields to automated gamification in terms of the speed and consistency with which reinforcement is delivered [4]. The integration of ethically oriented mechanisms grounded in self-determination theory and mathematical models of reward optimization makes it possible to construct digital products that do not merely retain attention, but connect motivational loops to the formation of practical skills, including hygiene, physical activity, and financial literacy.

The purpose of the study is to identify and provide a theoretical foundation for ethically oriented gamification mechanisms in family digital platforms that foster the development of stable and psychologically healthy digital habits in children.

The scientific novelty of the study lies in a comprehensive comparison of behavioral, mathematical, and ethical-normative approaches to the design of family digital platforms, which makes it possible to consider positive reinforcement both as a tool for increasing engagement and as an object of ethical and legal calibration.

The author's hypothesis is based on the assumption that ethically designed gamification mechanisms grounded in predictable positive reinforcement, support for autonomy, and the rejection of manipulative patterns are more effective in cultivating healthy digital habits in children than systems aimed exclusively at attention retention and behavioral dependency.

The practical significance of the study is determined by the fact that the ethically oriented gamification mechanisms described in the paper may be applied in the design of family digital platforms aimed not merely at retaining a child's attention, but at fostering stable behavioral practices related to self-regulation, everyday discipline, digital hygiene, physical activity, and financial literacy. The proposed approach makes it possible to regard positive reinforcement, predictable feedback, age-appropriate task adaptation, and the rejection of manipulative interface solutions as interconnected elements of a safe digital architecture capable of supporting the development of beneficial habits without intensifying dependence on screens and external stimuli.

The findings of the study are of particular importance for the United States, where a high level of children's digital engagement coincides with the active expansion of family applications, EdTech platforms, parental control tools, and digital services oriented toward minor users. Under these conditions, the mechanisms examined in the study acquire not only pedagogical and behavioral significance but also legal relevance, since their implementation corresponds to the current demand for product design compatible with child privacy protection requirements, the restriction of unfair digital practices, and the principle of the primacy of the best interests of the child in the digital environment.

Materials and Methods

The methodological foundation of the study was formed through the comprehensive processing of heterogeneous sources published in recent years, including academic publications indexed in the Scopus and Web of Science databases, analytical materials issued by international organizations (OECD, UNICEF, and the Pew Research Center), as well as market reviews and forecast reports produced by Deloitte and Gartner. As a key methodological decision, the study employs a synthesis of quantitative and qualitative data, making it possible, at one and the same time, to reconstruct stable patterns of user behavior and to assess the effects of gamified interventions in the context of family digital platforms.

Within the theoretical and methodological framework, the design of task systems is interpreted through the combination of three mutually complementary models. First, B. J. Fogg's Behavior Model is employed, according to which a behavioral act (B) occurs when motivation (M), ability (A), and a prompt or trigger (P) are present simultaneously. In family platforms, gamification is treated as a mechanism for strengthening M through structured reward and as an instrument for increasing A through the decomposition of complex behavioral patterns into "micro-tasks" or tiny habits, which reduce both the threshold of entry and the cognitive cost of action [5, 6]. Second, Nir Eyal's Hook Model is introduced, describing the four-stage cycle of "trigger -

action - variable reward - investment." The application of this framework is subjected to critical examination with respect to the use of variable reward in products designed for children, since it potentially intensifies an engagement loop with dependency-forming features; accordingly, the study emphasizes the priority of more predictable and ethically acceptable reinforcement schedules as an alternative [8]. Third, Self-Determination Theory (SDT) establishes the normative and psychological perspective within which the sustainability of behavioral change is linked to the satisfaction of the needs for autonomy, competence, and relatedness, thereby making it possible to distinguish constructive motivational solutions from manipulative ones [4].

The empirical and analytical block relies on the processing of results from field experiments and comparative studies aimed at evaluating the effectiveness of different reinforcement regimes. To calculate optimal moments for the allocation of points and for calibrating trajectories of engagement, Markov decision processes (MDPs) are employed, allowing the reward strategy to be formalized as an optimization problem in a probabilistic environment [11]. In addition, data from comparative studies conducted in 2024, which juxtapose the effects of parental praise and automated reinforcement systems, are integrated into the analysis, together with the results of the implementation of augmented reality (AR) applications in school practices recorded in 2025 [4].

The ethical evaluation of design decisions was carried out through reference to catalogs of dark patterns and to principles of protected design for children, which makes it possible to identify hidden mechanisms of coercion, asymmetries of control, and forms of non-voluntary attention retention [13]. The validation of the final conclusions was implemented through a comparison of the identified regularities with market dynamics and expert forecasts by Gartner and Deloitte concerning the development of AI tools and the deepening of personalization in EdTech, which makes it possible to connect the micro-level of behavioral mechanisms with the macro-level of technological and institutional trends [15].

Results and Discussion

The current landscape of digital consumption indicates that personal devices have become embedded in the everyday lives of minors earlier than had previously been anticipated: the mobile device has ceased to function merely as a shared family resource and is increasingly perceived as an individual item intended for sustained personal use. By 2025, 81% of children under the age of 13 had access to or possession of their own mobile device within patterns of regular screen-based interaction, according to parent-reported data and child media-use assessments [2, 17]. It is appropriate to reflect the distribution of ownership and the character of device use across age groups in Table 1, since the differences between preschool and early school age are expressed not only in frequency of access, but also in the purposes for which devices are used [1, 17].

Empirical observations from recent years show that, in the younger age segment, the dominant pattern is one of "mobile access through the tablet," whereas, with movement toward the 10–13 range, the share of smartphones increases as the principal channel of communication and digital-content consumption. Available analytical materials indicate that even in the earliest cohorts, personal and semi-personal screen devices are already widely present, while tablets remain the most typical form factor in early childhood; this, in turn, points to a structural shift in demand toward devices oriented to multimedia consumption, entertainment, and educational applications [2, 18]. At the same time, broader studies on children's technology use demonstrate that by adolescence, personal phones and app-based digital routines become normalized elements of everyday life, confirming the tendency toward the consolidation of the individual device as a basic component of the child digital environment [1, 17, 19].

Market indicators, meanwhile, are shaped not only by device sales, but also by the surrounding infrastructure: the share of parental-control services, child profiles, subscription models for educational and developmental products, as well as solutions embedded at the operating-system level, continues to grow. Under such conditions, competition shifts away from hardware alone and toward ecosystems capable of ensuring safe modes of use, age-sensitive segmentation of content, and manageable communication functions. Indirect confirmation of this shift may be found in the expansion of educational applications, family-oriented digital products, and platform-level tools designed to structure

children's engagement, filter content, and regulate time of use as standard product components rather than optional additions [15, 18, 20, 21].

Finally, the intensification of public concern regarding the early and intensive use of screen-based devices is increasingly translated into regulatory and quasi-regulatory benchmarks. Particularly revealing in this respect are the policy-oriented frameworks advanced by the OECD, UNICEF, and pediatric health institutions, where direct attention is given to the need to protect children from harmful forms of digital exposure, to limit manipulative and developmentally inappropriate design, and to place child well-being above purely commercial metrics of engagement [29, 30, 31, 33]. Documents of this kind, while not always possessing the force of statutory law, effectively establish a standard of due care for educational organizations, digital-service providers, and parents [29, 31]. For the market, they set a clear vector toward the development of solutions that prioritize privacy protection, minimize unnecessary data collection, and exclude behavioral architectures capable of provoking compulsive or dependency-forming use.

Table 1. Statistics of Device Ownership and Patterns of Digital Device Use Among Children (compiled by the author based on [1]).

Age group	Have a personal smartphone (%)	Use a tablet (%)	Daily YouTube use (%)	Primary risk
< 2 years	0%	40%	35%	Delayed cognitive development
2–4 years	10%	58%	51%	Sleep disruption
5–8 years	25%	68%	54%	Formation of dopamine-cycle habits
9–12 years	29–60%	68%	54%	Cyberbullying and social pressure
13–17 years	95%	-	95%	Addiction and depressive states

A substantial increase has been observed in the share of daily video-content consumption on YouTube among children under two years of age-from 24% in 2020 to 35% in 2025 [17]. This dynamic confirms that digital platforms begin to mediate the formation of stable patterns of attention and preference even before the emergence of fully developed verbal communication, that is, at a stage when behavioral responses are consolidated primarily through the repetition of stimuli and their emotional coloring.

At the same time, the educational technology segment demonstrates a high degree of adaptability to these conditions: scenarios based on game mechanics, which make it possible to sustain participation through child-comprehensible goals, progress markers, and rewards, are becoming increasingly widespread. Approximately 60% of educators regard gamification as one of the most effective ways to increase engagement [20, 24].

The market for habit-tracking applications is also showing accelerated growth. Its value was estimated at USD 1.7 billion in 2024, with projected growth to USD 5.5 billion by 2033 [21]. The key drivers include family demand for planning and self-regulation tools, as well as a growing desire to maintain psychological well-being under conditions of intense informational saturation in everyday life.

One of the central explanatory mechanisms in the

context of shaping everyday behavioral patterns among minors is the shift in favor of immediate reward-a cognitive orientation in which immediate pleasure (play, video viewing) is preferred over delayed benefit (health improvement, knowledge acquisition) [11]. Traditional educational and parenting practices rely on social reinforcement, especially praise; however, its effect depends on the regularity and consistency of application, which often proves difficult under real-world conditions.

In 2024, a pilot study was conducted comparing the effectiveness of parental praise and automated gamification in relation to children's digital food journaling [4]. The resulting data, which should be reflected in Table 2, demonstrate differences in the reproducibility of reinforcement and the level of adherence to self-monitoring routines, which is significant both for evaluating the effectiveness of these tools and for the subsequent selection of a lawful architecture for digital solutions in family-oriented products.

Given children's early involvement in the digital environment, the legal significance of the precautionary principle in service design is increasing: the younger the child, the higher the probability that data will be processed in ways that indirectly reveal features of behavior, daily routine, and family life, and, consequently, the higher the risk of impermissible profiling. In U.S. law, COPPA links the permissibility of collecting personal data from children under 13 to the prior provision of notice and the receipt of verifiable parental consent, thereby establishing, de facto, a "consent before processing" standard for child-directed services and functions aimed at minors [7, 9].

In European Union law, particular attention must be paid to the consent regime applicable to information society services: Article 8 of the GDPR establishes a general threshold of 16 years, while allowing Member States to lower it, though not below 13 years, and simultaneously imposing on the controller the duty to make reasonable efforts to verify that consent has been given by the holder of parental responsibility over the child. This approach reinforces the significance of privacy by default and data minimization in products for children, including applications that use game-based stimuli and habit trackers, precisely because these products most often involve minors in regular cycles of interaction and the accumulation of behavioral data.

Finally, the expanding use of gamification and reward mechanisms brings to the forefront the question of the permissibility of behavioral influence through interface design. Regulatory practice and analytical materials of the U.S. Federal Trade Commission record growth in the use of so-called dark patterns-design decisions capable of misleading users or nudging them toward undesirable actions, including excessive data disclosure or making it difficult to refuse a service. In the child environment, such practices acquire heightened legal sensitivity, since they intensify asymmetry between the parties in digital interaction and may potentially be classified as unfair.

Table 2. Comparison of the Frequency of Positive Reinforcement (PR) Delivery Over a 28-Day Period (compiled by the author based on [4]).

Type of reinforcement	Average number of days delivered	Ease of delivery	Effect on intrinsic motivation
Parental praise	12.2 ± 5.8	Low (depends on parental presence)	Stably positive
Automated gamification	20.8 ± 12.3	High (instantaneous and autonomous)	Mixed (depends on design)

As can be seen from the data presented in Table 2, automation does in fact ensure a higher frequency of reward delivery-by 70%-which is of fundamental importance for the consolidation of stable behavioral associations, since reinforcement regularity functions as one of the factors supporting the consolidation of habitual action. At the same time, the principal scientific and practice-oriented limitation of such solutions

remains the preservation of acquired behavior after the "game-based" stimuli are withdrawn: once the reward mechanism is switched off, an extinction effect often appears, whereby the cessation of external reinforcement leads to a decline in the repeatability of the action if that action has not yet transitioned into an autonomously maintained routine [16, 24].

In 2024, the scientific literature consolidated an approach described as optimized gamification based on Markov decision processes: instead of a predetermined and fixed set of rewards, the system calculates a variable reinforcement value by taking into account the history of actions and the current probability of "relapse" or disengagement [11]. At the model level, this means a shift from linear point accrual to algorithmic reward allocation, where, if the probability of performing the target action declines, the intensity of reinforcement is temporarily increased in order to prevent dropout. Data from a 40-day field experiment confirm the practical viability of this approach: the group exposed to optimized gamification demonstrated an average target-action frequency of 14.71, whereas the active control group receiving standard feedback demonstrated a frequency of 11.64 [11]. At the same time, no statistically significant differences in habit strength on the Self-Report Habit Index were identified after the completion of the experiment [11], which indicates the predominantly "activating" role of algorithmic reinforcement and the need for additional psychological supports-semantic, social, and value-based-that can ensure behavioral stability beyond the digital environment.

Task design in family applications requires attention to developmental psychology and intrafamilial dynamics, since the same behavioral goal implies different modes of presentation, monitoring, and feedback at different ages. The ethical design principles articulated in 2025 establish the necessity of age segmentation: for ages 2–5, tasks should be predominantly visual and auditory, with competition and any purchase prompts excluded; for ages 6–8, reinforcement cycles should be predictable, using badges and animations together with a clear cause-and-effect relationship; for ages 9–12, autonomy should be expanded through choice, customization, and explainability regarding the usefulness of the task [22]. Within such a logic, the "user experience" should develop together with the child rather than remain a single unchanging template, thereby reducing the risk of cognitive overload while also preventing the substitution of educational goals with attention retention at any cost.

Particular attention should also be paid to applied models of financial literacy that demonstrate the transfer of gamified stimuli into real-world practice. The Greenlight and GoHenry platforms integrate reinforcement into payment infrastructure: rewards for completing household chores or learning modules are credited to a child's debit card, while educational blocks, including "Money Missions," build a connection between effort and economic outcome [23]. An additional effect is achieved through family-based "interest rewards" on savings, when legal guardians set conditional percentages on accumulated funds, thereby reinforcing a model of long-term planning and savings discipline [23]. Importantly, although such mechanics may appear neutral on the surface, they require legally sound configuration: financial incentives in the child environment must be accompanied by transparent conditions and by the exclusion of hidden nudges toward spending.

As gamification scales, the problem of manipulative design techniques-dark patterns-also intensifies, that is, interface decisions that exploit cognitive biases in the developer's interest [13]. For minors, this category of risk becomes especially acute because of age-related emotional and volitional immaturity. Among the most vulnerable practices are coercive cycles aimed at maintaining a continuous "streak" of actions and built around the fear of losing progress: missing a day is experienced as a "loss of achievement" and may generate guilt and withdrawal from interaction rather than support a healthy routine [14]. Consequently, an architecture that excludes punishment for missed days and allows the restoration of routine without stigmatizing signals becomes both legally and ethically justified.

A new layer of risk is created by parasocial relationships with intelligent agents, when a digital character simulates empathy and constant support, thereby creating the illusion of stable attachment. Studies from 2025 point to the probability of emotional dependency on such "companions," which may displace real communication skills and reduce resilience to frustration in interpersonal contact [25]. As a result, child-oriented products increasingly require limitations

on the anthropomorphization of assistants, on intrusive messages voiced on behalf of the character, and on techniques that encourage prolonged dialogue without functional necessity.

No less significant is the risk of distortion in adolescents' worldview as a result of algorithmically shaped "information bubbles," in which content delivery reinforces preexisting attitudes and reduces the level of critical reflection [26]. For legal analysis, this matters because, in such an environment, decisions concerning engagement, consent to data processing, and in-app purchases are made under the influence of configured recommendation systems and therefore under conditions of informational inequality and user vulnerability. In 2025, the European Commission published guidance concerning the protection of minors in the context of the Digital Services Act, directing platforms toward proportional safety measures and the minimization of risks to children.

It should additionally be taken into account that the transition from "soft" ethical standards to legally significant requirements makes the principle of data protection by design and by default (Article 25 of Regulation 2016/679) especially important: by default, only the information necessary for a specific purpose should be processed, with limits on scope, storage periods, and accessibility. For family applications, this means that tasks, rewards, and progress statistics must not be transformed into excessive accumulations of behavioral profiles, while reinforcement mechanisms must not require the collection of data disproportionate to the declared aims [28, 32].

Finally, given the cross-border character of digital products, the legal landscape is supplemented by "child-centered" design regimes established in particular jurisdictions: for example, the California Age-Appropriate Design Code Act provides for requirements related to high privacy settings by default and risk assessments for children in relation to services likely to be accessed by minors. Taken together, these tendencies indicate the formation of a de facto due-diligence standard: gamification in family ecosystems is permissible only where it is demonstrably oriented toward the child's interests, transparent in its stimuli, and free from manipulative practices capable of transforming a useful task into an instrument of attention retention.

The features of the global EdTech gamification market are described in Table 3.

Table 3. Global EdTech Gamification Market: Shares of Components and Strategies (compiled by the author based on [20]).

Component / Strategy	Market share (%)	Growth forecast (CAGR)	Effectiveness (Completion Rate)
Software	84.6%	27.2%	-
Cloud deployment	92.8%	-	-
Use of points and badges	58.4%	-	Avg. increase of 14%
Gamified assessment	-	-	Growth from 25% to 80%
Mobile applications (K–12)	47.3%	45%	-

The data in Table 3 show that the use of game mechanics in corporate training and in the school sector can multiply the share of learners who complete a course-from 25% to 80% [27]. However, for family-oriented digital solutions, the "completion" indicator is not a self-sufficient criterion of effectiveness: the

priority lies in transferring the acquired skill into everyday practice, that is, in the stable reproduction of the action outside the interface and without constant external stimulation. In this respect, evaluation of the outcome should shift away from the formal "completion of modules" toward verifiable indicators of the consolidation of a behavioral routine, including regularity, contextual stability, and persistence after the withdrawal of rewards.

A new generation of applications seeks to overcome the effect of a "digital sedentary lifestyle" by linking educational scenarios with movement and embodied experience. A particularly illustrative example is the project "Vitalia," an augmented reality application for primary school in which physical exercise and basic nutrition are incorporated into a narrative structure marked by a sense of presence [12]. The mechanic presumes that virtual objects are "placed" into the home environment, while interaction with them becomes possible only when real physical movements are performed-jumping, bending, stretching-thereby establishing a connection between the educational task and motor activity [12]. Pilot trials conducted in 2025 describe a high level of adherence to the tasks, which is explained by the experience of "playing in real space" rather than "playing on a screen"; this logic confirms the growing significance of spatial computing as an instrument for improving digital habits and reducing screen-based passivity.

Despite favorable forecasts, the implementation of gamification encounters systemic barriers. A substantial share of educational organizations reports insufficient funding for the adoption of advanced platforms (46%), as well as a deficit of technical competence among teachers and parents (50%) [27]. These limitations have not only an organizational but also a legal projection: where digital literacy is low, the risk increases of incorrect privacy settings, mishandling of minors' accounts, and inadequate control over data collection. This makes simple and verifiable default safety modes, as well as implementation support through instructional materials and consultative guidance, especially necessary.

A separate risk is recognized in the phenomenon of "gamification for the sake of gamification," when game elements displace the pedagogical objective and become an end in themselves for retaining attention. Research shows that badges, when applied in isolation and without linkage to learning outcomes, often produce a mixed effect: motivational perception may improve, yet no increase in academic effectiveness or quality of learning occurs, and, under unsuccessful design conditions, cognitive load and fatigue may actually increase [10]. In light of this, gamification retains didactic value only when deeply integrated into educational logic, when the child's individual motivational profile is taken into account, and when mechanics aimed primarily at entry frequency and session duration are excluded [10].

In 2025, the OECD and a number of other organizations emphasized the role of parents as active participants in the digital process, thereby establishing a framework for shared media engagement: the digital environment is understood not as a "substitute" for adult participation, but as a space of joint activity and discussion [29]. The corresponding policy framework underscores the significance of teaching parents' skills of digital guidance, co-play, and content moderation as one of the major directions of action (Pillar 3) [30]. Empirical data indicate that the effect of educational applications on preschool children is significantly strengthened when content is viewed and discussed jointly with an educator or another adult, since shared attention and dialogue increase both depth of information processing and the quality of skill transfer [31].

It should also be taken into account that augmented reality and sensor-based solutions, by their nature, involve a broader set of information about the surrounding environment and the child's behavior, including elements of spatial context and motor activity. In family and school scenarios, this strengthens the significance of the principles of minimization and purpose limitation: for the fulfillment of health-promoting tasks, aggregated indicators and local processing are sufficient, whereas excessive storage of "raw" data increases the risk of profiling and secondary misuse. For precisely this reason, the architectural requirements applied to such products must proceed from the priority of safety and privacy as a baseline standard rather than as an option switched on only when resources permit.

The long-term effect of gamified interventions is closely related to the extent to which the action becomes part of the family routine and acquires "external support"

beyond the application itself: schedules, role distribution, agreed rules, and non-punitive monitoring. In the medical and behavioral literature, it is emphasized that digital interventions more often demonstrate short-term effectiveness, whereas long-term sustainability increases when family involvement is present and when digital tools are combined with offline practices that reduce dropout and support regularity. This confirms the need to design tasks in such a way that digital reinforcement gradually gives way to meaning-based and social motivators, while the criteria of success register not activity within the interface, but the stabilization of behavior in everyday life.

Finally, the thesis of shared media engagement is supported not only by normative and policy-based reasoning, but also by an evidentiary basis: joint media use by adults and children is associated with more favorable indicators of language development and communication quality because it creates additional occasions for conversation and explanation of content. In the context of family platforms, this means that mechanics of shared tasks and discussion perform the function of a "psychological anchor," increasing the probability of skill transfer and reducing dependence on purely game-based stimuli, which directly corresponds to the task of skill integration rather than the formal completion of a course [31].

Conclusion

The analysis of ethically oriented gamification mechanisms in 2024–2025 indicates the attainment of a level of technological maturity at which game-based practices cease to be reducible to entertainment alone and begin to function as an instrument for the purposeful formation of behavioral patterns compatible with the criteria of digital well-being. The shift from heuristic, intuitively constructed design toward mathematically optimizable systems of reinforcement expands the potential for the prevention of digital dependency and compensatory sedentary-life strategies, including hypodynamia, through a more precise calibration of motivation, effort, and feedback loops.

At the applied level, the design of family task systems should begin with a principled refusal to exploit age-based and cognitive vulnerabilities. The use of dark patterns, in particular rigidly fixed daily streaks, forms a fragile dependence on uninterrupted continuity and intensifies the experience of failure when inevitable interruptions occur; for that reason, preference should be given to flexible reinforcement schedules that allow recovery without sanctions and that support resilience to setbacks at the level of self-regulation. Such a restructuring of reinforcement architecture shifts the emphasis away from the disciplinary logic of "never break the chain at any cost" and toward long-term sustainability and psychological safety.

A critically important condition is identity reinforcement as a higher motivational level in comparison with the mere accumulation of points. Ethical gamification should strengthen internal self-descriptions aligned with educational and health-related goals-for example, by consolidating the representation of the self as a subject oriented toward learning or toward care for health-rather than reducing motivation to the role of a participant performing actions for the sake of an external score. Under such conditions, game mechanics become a means of semantic stabilization of behavior: reward supports not only the action itself, but also the interpretation of that action as an element of a personal developmental trajectory.

A promising line of development lies in moving tasks beyond screen-based interaction and translating habit formation into a physically active mode. The integration of augmented reality and IoT-class devices makes it possible to connect task completion with physical actions and observable changes in real space, thereby reducing the risk of "screen enclosure" and strengthening the transfer of skills into everyday life. This approach is especially important for tasks aimed at increasing motor activity and developing routines in which the bodily component functions not as a secondary feature, but as a system-forming one.

Algorithmic transparency and data governability require a distinct normative status. In accordance with UNICEF principles (2025 edition), family platforms should provide an understandable explanation of the logic of reward and personalization, while also offering privacy-control tools that make it possible to regulate the collection, use, and transfer of data both at the parental level and at the level of child profiles. Transparency in this context functions not as a merely formal procedure of notification, but as a mechanism for preventing asymmetry of power between the platform and the

family.

The functional effectiveness of contemporary solutions is strengthened through the use of adaptive AI; however, its implementation presupposes strict ethical calibration. Personalization should be expressed in the dynamic adjustment of task difficulty and reward intensity depending on current capabilities and emotional state, thereby preventing both motivational degradation through boredom and depletion through overload. In this sense, adaptability is understood as a means of maintaining a "zone of optimal tension," in which effort remains manageable while progress remains observable and psychologically reinforced.

The developmental vector of family digital platforms is associated with the construction of "safe harbors," within which game mechanics function as the connecting link between virtual reward and real indicators of well-being. Ethical gamification, in this perspective, transforms technology from a factor that fuels anxiety and conflict around screen time into an institutionally and psychologically calibrated resource for the formation of healthy, responsible, and digitally literate behavioral strategies.

The limitation of the study lies in its predominantly theoretical and analytical character, as it is based on the synthesis of previously published empirical, market, and regulatory sources. As a result, the conclusions drawn require further verification through long-term field research on family digital platforms across diverse sociocultural and legal contexts.

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