

Misión Korex: A Gamified System to Promote Physical Activity in Childhood Contexts

Teresita Reymond Ochagavía and Patricia Manns Gantz

Facultad de Arquitectura, Diseño y Estudios Urbanos, Pontificia Universidad Católica de Chile, Santiago, Chile

teresita.reymond@uc.cl

pmanns@uc.cl

Abstract: Childhood obesity and physical inactivity represent critical public health challenges in Chile. More than half of primary school students present excess weight, with a significant proportion classified as obese, while only 16.5% of children aged 5–17 are considered physically active and 48.4% are classified as inactive. Despite policy frameworks that mandate increased daily physical activity in schools, most institutions lack practical tools to implement these requirements within existing routines, generating a persistent gap between formal expectations and everyday practice. This paper presents Misión Korex, a gamified system that promotes physical activity among early primary school students (ages 6–8) by integrating wearable technology, immersive narrative, and collaborative game dynamics into everyday contexts. The system operates through three interdependent components: a movement-tracking wearable, a school-based data station, and a collective narrative in which students generate energy through physical activity to achieve shared goals. By embedding movement into existing daily moments—such as transitions, break times, and commuting—the system reduces implementation barriers without requiring substantial infrastructure investments or curriculum modifications, enabling scalable adoption in diverse school contexts. Developed through a design-led research approach, Misión Korex has evolved through iterative prototyping, co-design with interdisciplinary experts, and preparation for a real-world validation pilot in a public school setting. The system is designed to foster intrinsic motivation, collective engagement, and sustained participation, while generating objective data on physical activity patterns that can inform decision-making at both school and system levels. This study contributes to the field of Game-Based Learning by extending its application beyond academic learning into the domain of health and wellbeing. It presents a scalable and context-sensitive approach to embedding physical activity into children's everyday environments, while supporting the development of evidence-based strategies for long-term behaviour change.

Keywords: Gamification, Wearable technology, Physical activity, Childhood obesity, Primary education

1. Introduction

1.1 The Problem: Childhood Obesity and Physical Inactivity

The World Obesity Federation (2024) projects that over 750 million children aged 5–19 will have overweight or obesity by 2035. Although childhood obesity is a multifactorial wicked problem characterised by interconnected causes and no single solution (World Health Organization, 2021; Rittel and Webber, 1973), physical activity remains among its most accessible modifiable factors. In Chile, only 16.5% of children aged 5–17 are physically active and 48.4% are inactive (MINDEP, 2019). Physical activity in childhood is linked to cognitive and socio-emotional development (Singh et al., 2012), and habits formed at this stage persist into adulthood (Telama et al., 2005). Chile's National Strategy against Overweight and Obesity 2023–2030 (MINSAL, 2023) identifies the school environment as a priority intervention space—a policy opening that Misión Korex seeks to occupy.

1.2 The School Context

The national curriculum allocates only three weekly hours of physical education to the first cycle of primary education (NB1, equivalent to grades 1–2) (MINEDUC, 2018), well below WHO recommendations. Chile's Law 21.778 mandates 60 minutes of daily physical activity in schools, yet most institutions lack the tools to comply. Misión Korex addresses this gap by embedding physical activity into existing everyday moments—such as active commuting, break times, and transitions—without requiring substantial infrastructure investments or curriculum modifications.

2. Theoretical Framework

2.1 Game-based Learning, Gamification and the MDA Framework

Game-based learning (GBL) uses games with explicit pedagogical objectives, where mechanics and learning are inseparable (Plass, Homer and Kinzer, 2015). Gamification incorporates game design elements into non-game contexts to influence behaviour (Deterding et al., 2011). Misión Korex operates at the intersection of both, designing a complete game experience—narrative, mechanics, progression, collective objectives—within the

school's everyday routine, which Kapp (2012) terms structural gamification. The MDA (Mechanics, Dynamics, Aesthetics) framework by Hunicke, LeBlanc and Zubek (2004) serves as the projective scaffold: mechanics—movement detection, energy accumulation, weekly synchronisation—generate dynamics of peer collaboration and motivation, producing the intended aesthetics of belonging, collective agency, and sustained motivation. Sailer and Homner (2020) confirm gamification is effective when aligned with intrinsic motivation; Mekler et al. (2017) warn that systems relying solely on extrinsic rewards lose effectiveness over time.

2.2 A Design Approach: Social Innovation, Positive Design and Systemic Design

The design of Misión Korex draws on three complementary frameworks. Design for social innovation (Manzini, 2015) holds that design activates social change by enabling communities to develop their own practices from within. Misión Korex co-constructs conditions for everyday movement to acquire collective meaning. Positive design (Desmet and Pohlmeier, 2013) proposes that design actively contributes to human flourishing through components of subjective wellbeing—moving decisions beyond technical functionality towards intrinsically meaningful experiences. Finally, systemic design (Jones and Van Ael, 2022) approaches complex problems as systems of multiple actors and interdependencies. Misión Korex simultaneously involves technology, pedagogy, public policy, and family context, requiring design that attends to relationships between components rather than each in isolation.

3. System Description: Misión Korex

Misión Korex integrates three interdependent components. The Korex bracelet is a screenless wearable that records movement via accelerometry, classifying activity at different intensity levels and generating a cumulative metric integrated into the game logic. The Energy Portal is a physical station installed in the school enabling periodic proximity-based data synchronisation, and serves as the visible interface where students observe individual and collective progress. The gamified narrative positions students in a collective mission—accumulating energy to face a common threat, “The Shadow”—reframing physical activity as purposeful collective action and fostering intrinsic motivation.

At the dynamic level, the system prioritises cooperation over individual competition: each student contributes from their own activity level, naturally including students with different physical abilities and avoiding exclusion dynamics. The experience unfolds across four semesters of narrative cycles with milestones that reinforce collective progress, accompanying students throughout first and second grade.

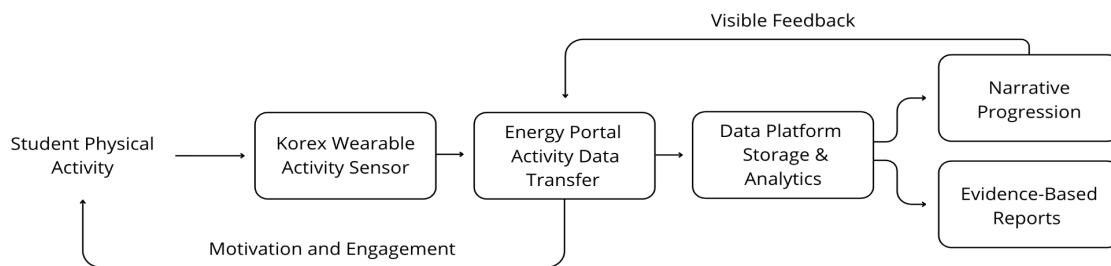


Figure 1: Overview of the Misión Korex system architecture and motivational feedback loop. Physical activity is measured through a wearable device, transferred via the Energy Portal to a central data platform, and translated into narrative progression and evidence-based reports

4. Methodology

The project follows a mixed-methods design-led research approach (Hanington and Martin, 2012) organised in three iterative phases. Phase 1 focused on Participatory Design workshops with schoolchildren, individual interviews with teachers, and iterative prototyping using the Rapid Iterative Testing and Evaluation (RITE) method (Hanington and Martin, 2012), producing the Korex bracelet, Energy Portal, pedagogical materials, and data architecture. Phase 2 consisted of individual and successive co-design sessions with eleven specialists across complementary disciplines—physical education, health, strategic design, public policy, and technology transfer—refining tangible elements, user interactions, pedagogical dynamics, and implementation strategy in each feedback cycle. Phase 3 is the validation pilot at Escuela Allipén D-338 (Conchalí, Santiago), selected due to its representative sociodemographic profile. A formal collaboration agreement has been signed. The study

combines Behavioural Mapping for systematic observation of physical activity in non-structured moments; pre- and post-intervention surveys; and Directed Storytelling interviews (Hanington and Martin, 2012), cross-referenced with objective wearable data.

5. Development Results

Participatory design workshops with children identified three recurrent motivational drivers: visible progress, collective achievement, and narrative immersion. These findings informed the definition of the system's core mechanics, including shared progression goals, real-time feedback through the wearable, and a collective storyline structured around energy generation. Subsequent co-design sessions with interdisciplinary experts refined the technological architecture, implementation strategy, and classroom integration, leading to the current configuration of the wearable, Energy Portal, and narrative framework. These iterative phases contributed to the conceptual and technical maturation of the system and resulted in a pilot-ready intervention adapted to the operational conditions of public schools. The development process also validated the internal coherence between narrative, mechanics, and dynamics (Kapp, 2012), enabling physical activity to be experienced as a meaningful collective activity rather than an individual performance obligation.

6. Discussion

The development results highlight the potential of gamified systems to promote physical activity in educational contexts. Misión Korex demonstrates the relevance of integrating technological, narrative, and pedagogical dimensions in behaviour-change interventions, consistent with design for social innovation (Manzini, 2015). A key finding is the importance of involving the child's complete ecosystem: effectiveness depends on each actor connecting with the gamified experience from their own motivation, consistent with Self-Determination Theory (Deci and Ryan, 2000).

Physical activity is one of the most accessible ways to intervene in a wicked problem (Rittel and Webber, 1973) such as childhood obesity. Its benefits extend beyond physical health, while habits formed at this stage persist into adulthood (Singh et al., 2012; Telama et al., 2005). Intervening early through positive design (Desmet and Pohlmeier, 2013) transforms everyday movement into an opportunity for flourishing.

More broadly, by aligning with Chile's Law 21.778, Misión Korex exemplifies how design acts as a mediator between a normative mandate and its effective implementation in real school conditions, reducing institutional adoption barriers.

7. Conclusion

Misión Korex proposes an approach to promote physical activity in the school context, integrating gamification, intrinsic motivation, and wearable technology to embed movement into the everyday moments of school life. The system addresses the gap between public health policy and its effective implementation, offering a strategy grounded in the real conditions of schools. Its capacity to generate objective physical activity data enables the construction of empirical evidence. In doing so, the project contributes to the GBL field by expanding its application beyond academic learning as a tool for behaviour change in health and wellbeing contexts. Future research should focus on empirical validation and longitudinal evaluation of adherence.

Acknowledgements

This work was supported by the National Agency for Research and Development (ANID), Chile, through the VIU programme. The authors acknowledge the support of Pontificia Universidad Católica de Chile in the development and validation of the project.

Ethics Declaration: This research adheres to the human subjects research protocols of the Pontificia Universidad Católica de Chile. Informed consent will be obtained from parents and assent from students. Physical activity data will be treated anonymously in compliance with Chile's Personal Data Protection Law.

AI Declaration: Artificial intelligence tools were used to support editing and proofreading. All conceptual content, data, and conclusions are the sole responsibility of the authors.

References

Deci, E.L. and Ryan, R.M. (2000) 'The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior', *Psychological Inquiry*, Vol. 11, No. 4, pp. 227–268. doi:10.1207/S15327965PLI1104_01.

- Desmet, P.M.A. and Pohlmeier, A.E. (2013) 'Positive design: An introduction to design for subjective well-being', *International Journal of Design*, Vol. 7, No. 3, pp. 5–19. doi:10.2752/175630613X13534303442229.
- Deterding, S., Dixon, D., Khaled, R. and Nacke, L. (2011) 'From game design elements to gamefulness: Defining "gamification"', *Proceedings of the 15th International Academic MindTrek Conference*, pp. 9–15. doi:10.1145/2181037.2181040.
- Hanington, B. and Martin, B. (2012) *Universal Methods of Design*. Rockport Publishers, Beverly, MA.
- Hunicke, R., LeBlanc, M. and Zubek, R. (2004) 'MDA: A formal approach to game design and game research', *Proceedings of the AAAI Workshop on Challenges in Game AI*, San Jose.
- Jones, P. and Van Ael, K. (2022) *Design Journeys through Complex Systems*. BIS Publishers, Amsterdam.
- JUNAEB (2023) *Informe Mapa Nutricional 2023*. Junta Nacional de Auxilio Escolar y Becas, Santiago.
- Kapp, K.M. (2012) *The Gamification of Learning and Instruction*. Pfeiffer, San Francisco.
- Manzini, E. (2015) *Design, When Everybody Designs: An Introduction to Design for Social Innovation*. MIT Press, Cambridge.
- Mekler, E.D., Brühlmann, F., Tuch, A.N. and Opwis, K. (2017) 'Towards understanding the effects of individual gamification elements on intrinsic motivation and performance', *Computers in Human Behavior*, Vol. 71, pp. 525–534. doi:10.1016/j.chb.2015.11.048.
- MINDEP (2019) *Encuesta Nacional de Hábitos de Actividad Física y Deporte*. Ministerio del Deporte, Santiago.
- MINEDUC (2018) *Bases Curriculares de 1° a 6° Básico*. Ministerio de Educación de Chile, Santiago.
- MINSAL (2023) *Estrategia Nacional para Detener la Aceleración del Sobrepeso y Obesidad en Niños, Niñas y Adolescentes 2023-2030*. Ministerio de Salud, Santiago.
- Plass, J.L., Homer, B.D. and Kinzer, C.K. (2015) 'Foundations of game-based learning', *Educational Psychologist*, Vol. 50, No. 4, pp. 258–283. doi:10.1080/00461520.2015.1122533.
- Rittel, H.W.J. and Webber, M.M. (1973) 'Dilemmas in a general theory of planning', *Policy Sciences*, Vol. 4, No. 2, pp 155–169.
- Sailer, M. and Homner, L. (2020) 'The gamification of learning: A meta-analysis', *Educational Psychology Review*, Vol. 32, pp. 77–112. doi:10.1007/s10648-019-09498-w.
- Singh, A.S., Uijtdewilligen, L., Twisk, J.W.R., van Mechelen, W. and Chinapaw, M.J.M. (2012) 'Physical activity and performance at school: A systematic review of the literature including a methodological quality assessment', *Preventive Medicine*, Vol. 52, No. 1, pp. 10–19. doi:10.1016/j.ypmed.2010.11.007.
- Telama, R., Yang, X., Viikari, J., Välimäki, I., Wanne, O. and Raitakari, O. (2005) 'Physical activity from childhood to adulthood: A 21-year tracking study', *American Journal of Preventive Medicine*, Vol. 28, No. 3, pp. 267–273. doi:10.1016/j.amepre.2004.12.003.
- World Health Organization (2021) *Obesity and Overweight*. World Health Organization, Geneva.
- World Obesity Federation (2024) *World Obesity Atlas 2024*. World Obesity Federation, London.