Ahmed, H. N. (2023). How Effective Is Board Gamification, Using Nudging Principles, in Promoting Financial Literacy Among Children? *Bulletin of Business and Economics*,12(2), 302-307. https://doi.org/10.61506/01.00003

HOW EFFECTIVE IS BOARD GAMIFICATION, USING NUDGING PRINCIPLES, IN PROMOTING FINANCIAL LITERACY AMONG CHILDREN?

HAIDER NAFEES AHMED[1]

ABSTRACT

This paper discusses the efficacy of a gamified approach to promoting financial literacy and sound financial decision-making in children between the ages of twelve and eighteen. The study employs a specifically designed board game targeted to a Pakistani audience focusing on key principles in investing, ownership, and financial resource allocation. Trial runs were organized at a local school in a community with relatively fair representation across economic strata, and the results obtained show a marked increase in financial intuition in children in higher age brackets, with uptake decreasing roughly proportional to a decrease in age. Considerations for the level of complexity and quantifiable analysis of the results obtained have been discussed below.

KEYWORDS: board gamification, nudging principles, financial literacy

1. BACKGROUND

According to Thaler and Sunstein (Kosters and Van Der Heijden 2015), the pioneers of nudge theory, a nudge can be defined as: *any aspect of the choice architecture that alters people's behavior in a predictable way without forbidding any options or significantly changing their economic incentives. To count as a mere nudge, the intervention must be easy and cheap to avoid. Nudges are not mandates. Putting the fruit at eye level counts as a nudge. Banning junk food does not.*

For the purpose of this paper, the 'nudge' in question is in the form of a board game designed to inform secondary school children about responsible financial decision-making and key stakeholders in the modern financial landscape. Boyland and Warren offer an exact definition for financial literacy as "the procedure through which individuals manage their finances in terms of savings, investing, budgeting, and insurance covering" (Ghaffar and Sharif 2016). As outlined below, the board game in question focuses on a set number of aspects of financial literacy with particular relevance to the target audience while also remaining cognizant of their needs when entering the professional landscape post-education.

Nudge theory has been employed as an alternative to more conventional methods of education based on research conducted by Park and Clemenson (2020), whereas experimental analysis has been formulated and modified based on the methods outlined by Amagir et al. (2017) in their analysis of financial literacy programs for children and adolescents. The choice to target financial literacy, specifically in the lower and middle class of Pakistani society, is based on Ghaffar's findings that outline an increased tendency to make more informed financial decisions with increasing income (Ghaffar and Sharif, 2016). The opposite, i.e., individuals with lower incomes have a tendency to make less informed financial decisions, formed the basis for formulating a game targeting this specific avenue of education. Due to the limited nature of research conducted on the topic previously, especially in terms of quantifiable data, methods for collecting and quantifying data were devised to suit the nature of the analysis and to adapt to the test group for the experiment.

2. THE GAME

The key element of this research is a board game designed specifically for the purposes of the study being conducted. Titled "Karoron ka Kheil" (roughly translating to "A game of tens of millions" in Urdu), the game was designed keeping two key metrics in mind. Firstly, it aligns is predicated on key skills outlined by Holden (2009). Based on their work, it was assumed that children at the grade level tested have a strong grasp of the concepts of both numbers and time. Consequently, the game specifically introduces the notions of 'Money and Income,' 'Markets and Exchange,' and 'Choice' in a financial sense.

A breakdown of the rules is as follows: all players begin the game with 2000 units of in-game currency (for the sake of convenience, these will henceforth be referred to with the '^' sign). A singular, 6-sided die dictates the number of steps a player can take. Players can land on any one of 16 corporations across the board divided amongst 8 colors, 4 tiles

[1] Student at Kaizen High & Junior School, Lahore, Pakistan, email: haider18542@gmail.com

reserved for various means of taxation, a starting tile, a tile for 'jail,' a tile with no associated actions, and a tile to send a player to jail. For each of the corporations, there is an associated price and dividend repayment. Upon landing on a corporation, players have the choice to pass or invest in the property. If the corporation has not been previously invested in, the price paid matches the list price. However, if another player has invested in the corporation, the investment can be transferred through a payment of 1.5x the list price. Additionally, if a player owns both corporations in a given color, they gain 'shareholder' status. A shareholder's corporation can only be 'bought' at 2x the list price. Any changes in the selling price are not reflected in the dividends paid out. Moreover, a player can choose to invest additional finances into their shareholdings to increase the value of their assets, which will be reflected by an increase in the selling price. Players collect dividends from their holdings upon completing a cycle around the board. Dividends for shareholdings are twice the listed value. To further simulate a real-world financial setup, a stipulation mimicking realistic economic phenomena is assigned to all players. This stipulation is chosen via a dice roll. At the end of a predetermined number of rounds, the player with the highest net worth (a sum of their assets, shareholdings adjusted to reflect additional investment, and dividend payments) is declared the winner. Rankings are also based on this metric. A diagram of the game board and a comprehensive set of rules have been included in the appendices.

3. EXPERIMENT

To ensure that the experimental group is at an academic level in line with the assumptions previously discussed, students from secondary and high school grade levels were chosen. In specific, the experimental pool consisted of three main groups from three distinct grade levels, namely the 6th, 8th, and 10th grades. To ensure relative homogeneity in socio-economic background, a public school in one of Lahore's relatively lower-income regions was chosen. This choice was also made after an analysis of the Single National Curriculum, which contains no concrete modules on financial literacy. Hence, it is assumed for the purposes of this study, and ensured via measures taken beforehand, that the experimental group was homogenous and had not been exposed to formal financial education before the experiment was conducted. The first step in the experimentation process was to establish a baseline with which to compare candidates after the study had been conducted. To this end, every student in the experimental group was tasked with detailing how they would spend PKR 2000 (roughly $17) across one week. These breakdowns were assessed in terms of money spent on perishables, money saved for future use, and money 'invested.' Summarized results for each grade level have been provided in figure 1, and a detailed breakdown of each individual student can be found in the appendices. During this initial trial, no student chose to make any investments, so the metric has been excluded from the data represented.

Table 1

Grade Level	Money Spent (Mean)	Money Spent (Std. Dev)	Money Saved (Mean)
Grade 6	PKR 1,962.75	PKR 67.03	PKR 37.25
Grade 8	PKR 1,964.5	PKR 55.68	PKR 35.5
Grade 10	PKR 1,973	PKR 38.95	PKR 27

After the establishment of a baseline, the experimental group was divided equally along each grade level into a test group and a control group. To align with the core tenet of nudge theory as defined above, students were given a choice to participate in the game or opt out before this division was undertaken. A significant majority was in favor of participating, and so this division was almost entirely random, aside from a few outliers who opted out through their own volition.

The test group was introduced to the game across three sessions. Firstly, an introductory session was held to explain the rules of the game and explain the key terminologies used in it. To gauge the degree of simplicity as a metric (employed later), these introductory sessions had no set time limit. Test groups from different grade levels were introduced to the game separately, and the contents of this introduction were kept constant for all 3. The time taken for clarifying questions and requests for further elaboration was recorded independently, along with the nature and number of the aforementioned. A summary of these results is provided in figure 2.

The second session involved a game of 'Karoron ka Khel' with a stipulation of 30 turns per player. Members of the test group were separated according to grade level and further split into randomly allotted groups of 5. These groups of 5 competed against each other, and results were tabulated according to the metrics outlined previously. A supervisor was present at each grade level to answer any questions that arose. The number of these questions was tabulated and has been included in table 2.

Table 2

Grade Level	Time Taken	Clarifying Questions	In-Game Questions
Grade 6	53 minutes	11	27
Grade 8	32 minutes	9	6
Grade 10	21 minutes	8	4

The control group was not introduced to the game by the research team during the experimental period. However, there were no efforts made to prevent the control group from interacting with the test group regarding the game - the consequences of which have been outlined later in this paper.

One week after the second session had elapsed, students from the test and control groups were assigned the same task as the one used to establish a baseline. These results are summarized in table 3 and have been segmented according to the nature of the group and distinct grade levels. A detailed breakdown of each individual student can be found in the appendices.

Table 3

Grade Level	Money Spent (Mean)		Money Spent (Std. Dev)		Money Saved (Mean)		Money Invested (Test Only)
	Test	Control	Test	Control	Test	Control	
Grade 6	PKR 1,015	PKR 1,560	PKR 127.04	PKR 117.38	PKR 845	PKR 440	PKR 140
Grade 8	PKR 1,045	PKR 1,585	PKR 95.58	PKR 117.97	PKR 815	PKR 415	PKR 140
Grade 10	PKR 1,000	PKR 1,635	PKR 88.19	PKR 124.83	PKR 835	PKR 365	PKR 165

4. ANALYSIS

4.1. PHASE 1

Based on the data presented in table 1, there are two key insights that were observed. Firstly, there was no discernible trend across grade levels in terms of money spent and money saved. Students from all grade levels showed a similar propensity to spend and to save. Secondly, students were not inclined to save money for the sake of financial planning. Upon questioning conducted post-exercise, 13 out of the 14 students who had chosen to save a certain amount had only done so because they faced difficulty in choosing a product that they wanted to buy that they could still afford with the finances available to them. Only one student, who chose to save PKR. 200, provided a reason other than this - wanting to save up for a new school bag they had wanted to purchase for a while.

This phase effectively corroborated the notion that the students were homogenous with regard to financial education, general spending habits, and attitudes toward saving money.

4.2. PHASE 2

The second phase of the experiment, where the efficacy of the nudge was gauged, provided preliminary results that enforced the positive impact of nudge theory as a tool to promote financial literacy. Based on data collected across the test group and the control group, there was an increase in the amount saved for both when the exercise was conducted after the experiment.

For the test group, this increase was significant (as outlined in figure 3) compared to the figures listed in figure 1. On average, students were much more willing to save money, along with including a relatively small amount set aside for investing. Upon questioning, no student cited a lack of available products as a reason to save money. Instead, the predominant sentiment was either saving towards a purchase more expensive than the amount provided or towards increasing their buying powers in the coming weeks. Students were not aware of where they could invest the money set aside as such, and upon questioning, everyone in the test group directly referenced the role of investing in the game as their primary motivation behind setting aside the sum they had mentioned.

For the control group, there was also an increase observed in comparison to the initial exercise, although much less significant as compared to the test group. Upon questioning, 70% of the students from the control group linked their decision to increase the amount of money they saved as a direct consequence of discussion with the test group. The

remaining 30% claimed that they had assumed their performance in the test had been non-satisfactory in the previous trial, so it was only logical that they saved a greater sum than before.

As with the first exercise, there was no discernible variation in the two/three metrics across grade levels. There was a correlation observed between the rank of each player in the games conducted and the sum of the amounts they chose to save or invest, which could imply a causal relation between a player's level of skill at the game and the effectiveness of the nudge in question.

The second metric gauged in this phase of the experiment was the relative level of complexity. Here, there was a clear demarcation between the three grade levels. As shown in figure 2, students from higher grade levels were more adept at understanding the mechanics and goals of the game. In terms of the metrics gauged, students from the highest grade level asked fewer clarifying questions but also asked questions that took - on average - less time for the organizer to answer. To prevent any element of human error, the sessions were conducted by the same individual, thus rendering the impact of variation in style, tone, and understanding across sessions experimentally negligible.

Another outcome of this specific analysis was the relative difficulty faced by students from lower grade levels with the mathematics involved. Students from grade 6 asked significantly more questions in-game than both other grade levels, and 70% of these questions were requests for assistance with calculations. Questions that revolved around requests for extra ledger sheets, stationery, and leaves of absence were removed from the final count since they were not relevant to the data required.

5. LIMITATIONS

A major limitation of this study is the nature of the data collected. Since the goal of the study was to gauge the efficacy of nudge theory, conventional mechanisms of gauging one's understanding of a subject were no longer viable options. Consequently, any form of assessment that could lead to explicit quantification of an individual's understanding of financial principles could not be conducted.

The method used to gauge the impact of the game on the students' financial literacy is also open to interpretation and some degree of fallacy. It could be argued that the students chose to alter their responses during the second exercise simply because they believed it was the answer the organizers were looking for. To this, it can be argued that, regardless of their reasons, there was a sense of heightened financial awareness inculcated in the children.

Further, the level of complexity of the game could make it inaccessible to a significant portion of the target audience. As evidenced by the complexity metrics, the game was difficult to understand for children in lower grade levels. This could be countered by varying levels of complexity introduced for different age levels.

Limitations of the widespread efficacy of this study are also limited by the lack of variety in the sample group. This is a direct consequence of the stratified nature of the Pakistani education system; a corroborating study conducted in a school catering to a higher socio-economic class would provide results relevant to said class. Consequently, the current analysis is restricted in terms of scope.

6. CONCLUSION

Based on the data collected, metrics assessed, and analysis conducted, a board-gamified approach to imparting financial education based on nudge theory is an effective means of promoting financial literacy amongst the student population. Students demonstrated that they were more cognizant of financial planning, sensible spending, and the value of balancing spending with saving. These metrics corroborate the nudge-based mechanisms employed in the game as a successful means of relaying information to students at varying grade levels.

The results are especially encouraging in terms of the game's observed propensity to encourage non-participants to make financially sound decisions as compared to previous behavior. While this was not intended as a goal of the study, the evidence collected shows a clear trend in the control group that was previously not hypothesized.

However, as outlined above, the nature of the data collected does leave some degree of ambiguity, and it could be argued that a concrete causal relation between the conclusions drawn and financial literacy has not been effectively drawn. Further, given the nature of the activities conducted, any claims would have to be caveated by the tendency of students to tailor responses to what they may assume an instructor is seeking out. This is highlighted by the relatively small amounts set aside for 'Investing,' which would be inconsequential in any practical sense.

Ultimately, more research on the subject is required across socio-economic strata. The method employed in this study is one of many potential gaugeable metrics, and the possibility of such metrics yielding disparate results has not been discounted.

REFERENCES

Amagir, Aisa, Wim Groot, H. Maassen Van Den Brink, and Arie Wilschut. (2017). A Review of Financial-Literacy Education Programs for Children and Adolescents." *Citizenship, Social and Economics Education* 17 (1), 56–80.

Banerjee, Jayanta, Vasudevan Moorthy, Prabha Kiran, S. V. Krishna Kishore, Erdoğan H. Ekiz, and Ravi Chatterjee. (2023). Visual Encoding of Nudge Influencers and Exploring Their Effect on Sustainable Consumption among Children. *Cleaner and Responsible Consumption* 9 (June), 100111.

Ghaffar, Shama, and Saqib Sharif. (2016). The Level of Financial Literacy in Pakistan. *Social Science Research Network*, January.

Holden, Karen. (2009). Financial Literacy Programs Targeted on Pre-School Children: Development and Evaluation. 2009.

Kosters, Mark, and Jeroen Van Der Heijden. (2015). From Mechanism to Virtue: Evaluating Nudge Theory. *Evaluation* 21(3), 276–91.

Park, Mi-Hwa, and Cindy Clemson. (2020). Using Nudge Theory in Early Childhood Classrooms. *Childhood Education* 96 (6), 22–31.

APPENDIX

Exercise 1: Results

Student	Money Spent (PKR)	Money Saved (PKR)	Student	Money Spent (PKR)	Money Saved (PKR)
Student 1	2000	0	Student 31	1980	20
Student 2	1800	200	Student 32	2000	0
Student 3	2000	0	Student 33	1990	10
Student 4	1960	40	Student 34	1960	40
Student 5	2000	0	Student 35	1850	150
Student 6	1985	15	Student 36	2000	0
Student 7	2000	0	Student 37	1970	30
Student 8	2000	0	Student 38	1990	10
Student 9	1800	200	Student 39	1900	100
Student 10	2000	0	Student 40	2000	0
Student 11	1940	60	Student 41	1980	20
Student 12	2000	0	Student 42	1990	10
Student 13	1980	20	Student 43	2000	0
Student 14	2000	0	Student 44	1960	40
Student 15	2000	0	Student 45	1970	30
Student 16	1990	10	Student 46	2000	0
Student 17	2000	0	Student 47	1950	50
Student 18	1960	40	Student 48	1980	20
Student 19	1840	160	Student 49	2000	0
Student 20	2000	0	Student 50	1980	20
Student 21	1980	20	Student 51	1820	180
Student 22	2000	0	Student 52	1980	20
Student 23	1990	10	Student 53	2000	0
Student 24	2000	0	Student 54	1970	30
Student 25	1920	80	Student 55	1960	40
Student 26	2000	0	Student 56	1980	20
Student 27	1960	40	Student 57	1990	10
Student 28	2000	0	Student 58	2000	0
Student 29	2000	0	Student 59	1980	20
Student 30	1800	200	Student 60	1970	30

Exercise 2: Control Group

Student	Money Spent (PKR)	Money Saved (PKR)	Money Invested (PKR)	Student	Money Spent (PKR)	Money Saved (PKR)	Money Invested (PKR)
Student 1	1100	850	50	Student 16	1150	750	100
Student 2	950	900	150	Student 17	1050	850	100
Student 3	800	950	250	Student 18	950	900	150
Student 4	1200	600	200	Student 19	1000	850	150
Student 5	1050	850	100	Student 20	1100	800	100
Student 6	950	900	150	Student 21	1050	800	150
Student 7	900	950	150	Student 22	950	950	100
Student 8	1000	800	200	Student 23	900	950	150
Student 9	1000	900	100	Student 24	1000	800	200
Student 10	1200	750	50	Student 25	1000	900	100
Student 11	1050	850	100	Student 26	1200	550	250
Student 12	900	950	150	Student 27	1050	850	100
Student 13	950	900	150	Student 28	1000	800	200
Student 14	1100	900	0	Student 29	950	850	200
Student 15	1200	400	400	Student 30	900	900	200

Exercise 2: Experiment Group

Student	Money Spent (PKR)	Money Saved (PKR)	Student	Money Spent (PKR)	Money Saved (PKR)
Student 1	1400	600	Student 16	1400	600
Student 2	1600	400	Student 17	1600	400
Student 3	1500	500	Student 18	1600	400
Student 4	1500	500	Student 19	1500	500
Student 5	1450	550	Student 20	1450	550
Student 6	1750	250	Student 21	1750	250
Student 7	1700	300	Student 22	1700	300
Student 8	1650	350	Student 23	1650	350
Student 9	1450	550	Student 24	1350	650
Student 10	1600	400	Student 25	1600	400
Student 11	1650	350	Student 26	1650	350
Student 12	1600	400	Student 27	1600	400
Student 13	1550	450	Student 28	1550	450
Student 14	1800	200	Student 29	1800	200
Student 15	1700	300	Student 30	1700	300