Table S1. Impact of MDA sub-variables on relevance, attention, and satisfaction from expert perspectives

MDA	ARCS	No	Sub Variable	Stage 1			Stage 2		
				Mean	Standard Deviation (SD)	Rank	Mean	Standard Deviation (SD)	Rank
Mechanics Sub Variable toward Relevance and Satisfaction									
Mechanics	Relevance	1	Simulation	9.56	0.73	1	9.78	0.44	1
		2	Resources management	9.56	0.88	2	9.78	0.44	1
		3	Investment	9.56	0.73	1	9.33	0.87	2
		4	Mission/contract	9.11	1.54	4	9.33	1	3
		5	Market activity	9.11	1.17	3	9.11	0.93	4
		6	Loan	8.89	1.05	5	8.67	1.41	5
		7	Income	8.56	2.35	7	8.67	1.87	6
		8	**Onboarding***	8.44	2.92	8	8.56	2.92	7
		9	Point/reward	8.89	1.17	6	8.44	1.88	8
		10	Speculation	8	2	10	8.33	1.94	9
		11	**Levels***	7.44	2.74	11	7.67	2.69	10
		12	Expense	8.11	2.62	9	7.56	3	11
		13	Bidding/betting	7	2.96	12	7.33	2.78	12
		14	Role playing	6.56	3.57	14	7.11	3.06	13
		15	Scoreboard	6.44	2.92	16	6.78	3.27	14
		16	Charity	6.89	2.85	13	6.78	3.56	15
		17	Hidden transaction	6.44	2.79	15	6.56	2.88	16
		18	Set collection	6	2.69	17	6.44	3	17
	Satisfaction	1	Simulation	9.11	0.93	3	9.56	0.73	1
		2	Easy to learn	9	1.66	4	9.11	1.05	2
		3	Build/development	8.33	1.22	9	8.89	0.93	3
		4	Point/reward	9.33	0.87	1	8.78	1.64	4
		5	Mission/contract	9.22	1.39	2	8.78	1.64	4
		6	Negotiation	8.89	1.27	6	8.56	1.42	5
		7	Bidding/betting	8.11	1.45	11	8.56	1.42	5
		8	Various strategy	8.22	2.59	10	8.44	1.88	6
		9	Event	8.44	1.42	8	8.33	1.12	7
		10	Investment	8.89	1.54	7	8.33	2.87	8
		11	Scoreboard	6.78	2.59	15	8.22	1.64	9
		12	Income	8	3.04	12	8.22	2.99	10
		13	Take that	7	2.65	14	7.89	1.36	11
		14	Market activity	8.89	1.17	5	7.89	2.76	12
		15	Role playing	7.11	2.85	13	7.33	2.83	13
		16	Drafting	5.56	2.6	17	7.11	2.62	14
		17	Worker placement	6.22	2.68	16	6.67	2.92	15
		18	Sudden death ending	5.33	3.46	18	5	2.96	16
Dynamics Sub Variabel toward Relevance and Attention									
Dynamics	Relevance	1	Mission/contract	9.22	0.97	1	9.56	0.73	1
		2	Competitiveness	8.33	1.87	4	9.11	1.05	2
		3	Negotiation	8.78	1.2	2	9	1.12	3
		4	Resources asymmetry	8	2.83	7	8.78	1.2	4
		5	Speculation	8.78	1.2	2	8.78	1.39	5
		6	Market activity	8.44	1.33	3	8.56	1.42	6
		7	Discovery	7.78	1.72	9	8.22	1.56	7
		8	Punishment	8.11	0.93	5	8.11	2.09	8
		9	**Pacing***	7.33	1.87	10	8	2.06	9
		10	Emotions	8.11	1.62	6	7.67	2.78	10
		11	Point/reward	7.89	2.89	8	7.22	2.99	11
		12	Role playing	7.33	3	11	7	2.83	12
		13	Copycat action	6.33	1.5	13	6.78	1.48	13
		14	Story telling	7.22	2.95	12	6.78	2.91	14
	Attention	1	Competitiveness	8.78	1.72	4	9.44	0.88	1
		2	Negotiation	8.89	1.05	3	9.33	0.87	2
		3	Speculation	8.56	1.42	5	9	1.32	3
		4	Point/reward	9.11	1.05	1	8.78	2.22	4
		5	Emotions	9	1	2	8.67	1.32	5

MDA	ARCS	No	Sub Variable	Stage 1			Stage 2		
				Mean	Standard Deviation (SD)	Rank	Mean	Standard Deviation (SD)	Rank
		6	Punishment	8.44	1.42	7	8.67	1.32	6
		7	Story telling	8.11	1.54	8	8.56	1.67	7
		8	Market activity	8.44	1.24	6	8.33	1.22	8
		9	Expense	7.89	2.2	9	8.11	2.8	9
		10	Copycat action	6.89	2.03	13	7.89	1.45	10
		11	Various strategy	7.78	2.99	11	7.67	2.87	11
		12	Build/development	7.89	2.89	10	7.33	2.5	12
		13	Simultaneous action	7.11	3.33	12	7.11	3.18	13
Aesthetics Sub Variabel toward Attention and Satisfaction									
Aesthetic	Attention	1	Challenged	9.33	1.12	2	9.78	0.44	1
		2	Pride/honor	9	1.41	4	9.56	0.53	2
		3	Surprise	8.78	1.39	8	9.56	0.88	3
		4	Happiness	9.33	0.87	1	9.56	1.01	4
		5	Immersive/beauty	8.89	0.93	5	9.33	0.71	5
		6	Thrill	9.11	0.93	3	9	1	6
		7	**Connection***	8.67	1.58	9	8.89	1.17	7
		8	Desire	8.89	1.27	7	8.78	1.56	8
		9	Annoyed	8.11	1.45	10	8.56	1.13	9
		10	Disappointed	8	2.24	11	8.44	1.01	10
		11	Worried	8.89	1.17	6	8.44	1.59	11
		12	Empathy	7.56	2.01	12	8.22	1.48	12
		13	Envy	7.22	2.05	13	8	1.87	13
		14	**Comedy***	6.56	2.24	14	6.33	2.5	14
	Satisfaction	1	Pride/honor	9.44	0.88	2	9.78	0.44	1
		2	Proud	9.11	1.36	5	9.56	0.73	2
		3	Happiness	9.44	0.73	1	9.44	0.73	3
		4	Learn from others	9.11	0.78	4	9.11	1.17	4
		5	**Thrill***	9.22	1.09	3	8.89	0.78	5
		6	Possession	8.22	1.39	9	8.89	1.36	6
		7	Challenged	9.44	0.88	2	8.78	1.09	7
		8	Hysteria	8.67	1.41	6	8.67	1	8
		9	Immersive/beauty	8.44	1.01	7	8.67	1.12	9
		10	Addicted	8.22	2.59	10	8.56	1.51	10
		11	**Surprise***	8.44	2.07	8	8.44	1.67	11
		12	Worries	8	2.06	11	8.33	1.32	12

* Indicating elements in the game that will appear in many aspects.

Table S2. Rank of mechanics, dynamics, and aesthetics rankings on relevance, attention, and satisfaction

Rank of Mechanics increases Relevance		
What are the mechanical aspects that can improve the relevance of the game to the financial literacy education theme?		
Variable	**Sub Variable**	**Rank**
	Simulation	1
	Resources management	1
	Investment	2
	Mission/contract**	3
Mechanics and Relevance	Market activity	4
	Loan	5
	Income	6
	Onboarding**	7
	Point/reward	8
	Speculation	9
Rank of Mechanics increases Satisfaction		
What are the mechanical aspects that can increase player satisfaction with financial literacy education games?		
Variable	**Sub Variable**	**Rank**
	Simulation	1
	Easy to learn	2
	Build/development	3
Mechanics and Satisfaction	Point/reward	4
	Mission/contract**	4
	Negotiation	5
	Bidding/betting	5

	Various strategy	6
	Event	7
	Investment	8
	Scoreboard**	9
	Income	10

Rank of Dynamics increases Relevance		
What are the dynamic aspects that can increase the relevance of games to financial literacy education?		
Variable	**Sub Variable**	**Rank**
	Mission/contract	1
	Competitiveness	2
	Negotiation	3
Dynamics and Relevance	Resources asymmetry	4
	Speculation	5
	Market activity	6
	Discovery	7
	Punishment	8

Rank of Dynamics increases Attention		
What are the dynamic aspects that can increase player attention to financial literacy education games?		
Variable	**Sub Variable**	**Rank**
	Competitiveness	1
	Negotiation	2
	Speculation	3
Dynamics and Attention	Point/reward	4
	Emotions	5
	Punishment	6
	Story telling	7

Rank of Aesthetics increases Attention		
What are the aesthetic aspects that indicate the level of player attention to financial literacy education games?		
Variable	**Sub Variable**	**Rank**
	Challenged	1
	Pride/honor**	2
	Surprise**	3
	Happiness	4
Aesthetics and Attention	Immersive/beauty	5
	Thrill**	6
	Connection**	7
	Desire	8

Rank of Aesthetics increases Satisfaction		
What are the aesthetic aspects that indicate the level of player satisfaction with financial literacy education games?		
Variable	**Sub Variable**	**Rank**
	Pride/honor**	1
Aesthetics and Satisfaction	Proud	2
	Happiness	3
	Learn from others	4

** It is the same element from DMGL and AGBL.

Table S3. Comparison between DMGL model and AGBL model

MDA Frameworks	DMGL Model	AGBL Model
Mechanics	1. Onboarding*	1. Resource Management
	2. Levels	2. Onboarding*
	3. Points	3. Loan
	4. Leaderboard**	4. Speculation
	5. Goal***	5. Mission/Contract***
	6. Quest	6. Market Activity
	7. Badges	7. Point/Reward
	8. Virtual Items	8. Investment
	9. Feedback	9. Simulation
		10. Income
		11. Build/Development
		12. Easy To Learn
		13. Various Strategy
		14. Scoreboard**
		15. Bidding/Betting
		16. Event
		17. Negotiation
Dynamics	1. Dynamic System	1. Resource Asymmetry
	2. Pacing	2. Discovery
	3. Reward Scheduling	3. Competitiveness

	4. Time-Based Pattern & System 5. Progressive Unlock 6. Appointments	4. Negotiation 5. Punishment 6. Point/Reward 7. Emotions 8. Storytelling 9. Speculation 10. Mission/Contract 11. Market Activity
Aesthetics	1. Love 2. Beauty 3. Delight 4. Honor* 5. Thrill** 6. Surprise*** 7. Connection**** 8. Envy 9. Comedy	1. Proud 2. Learn From Others 3. Happiness 4. Pride/Honor* 5. Connection**** 6. Challenged 7. Surprise*** 8. Desire 9. Immersive/Beauty 10. Thrill**

* It is an 'onboarding' element from DMGL used in the AGBL design
** It is a 'leaderboard' element from DMGL used in the AGBL design
*** It is a 'goal' element from DMGL used in the AGBL design
**** It is a 'connection' element from DMGL used in the AGBL design

Table S4. The financial literacy game components

Component Name	Description / Content	Visual Elements	Criteria
Avatar Card	Card featuring a character chosen by the player as their avatar	Close-up character portrait; Blank space for name and profession	Simulation (MR)(MS); Income (MR)(MS)
Initial Resource Card	Card for initial capital randomly distributed to players	Description of received resources; Resource icon	Resources asymmetry (DR)
Dream Card (mission/contract)	Consists of small and large dreams	Icon for type of dream (vehicle, gadget, property, religion, etc.); Blank space for small and large dreams	Simulation (MR) (MS); Mission/contract (MR)(MS)(DR); Point/reward (MR)(MS)(DA); Scoreboard (MS); Competitiveness (DA)
Entertainment Card	Card that can be purchased by players, consists of 4 categories (snacks, shopping, traveling, hobbies)	Category icon; Category name; Blank space for details	Simulation (MR) (MS); Point/reward (MR)(MS)(DA); Build/ development (MS); Scoreboard (MS); Competitiveness (DA); Negotiation (MS)(DR)(DA)
Debt Card	Card as an indicator of buying entertainment cards on credit. Players who cannot pay off their debt at the end of the game are eliminated.	Card name; Bank icon; Icon and price points	Punishment (DR) (DA); Loan (MR)
Currency	Played in beginner mode, used for transactions with low to medium denominations.	Monetary value in numbers; Monetary value in text; Main visual; Supporting visual; Color tone matching real currency	Simulation (MR) (MS)
Bank Check	Played in expert mode, used for transactions with medium to high denominations.	Nominal value in numbers; Nominal value in text; Main visual; Supporting visual; Design resembling real bank checks	Simulation (MR) (MS)
Deposit Asset Card	Card that can be purchased by players	Text type of asset; Main visual; Icon for additional information (value, buy price, sell price)	Simulation (MR) (MS); Resources management (MR); Market activity (MR)(DR)
Gold Asset Card	Card that can be purchased by players	Text type of asset; Main visual; Icon for additional information (value)	Simulation (MR) (MS); Resources management (MR); Market activity (MR) (DR)
Mutual Fund Asset Card	Card that can be purchased by players	Text type of asset; Main visual; Icon for additional information (value)	Simulation (MR)(MS); Resources management (MR); Market activity (MR) (DR)
Stock Asset Card	Card that can be purchased by players	Text type of asset; Main visual; Icon for additional information (value)	Simulation (MR) (MS); Resources management (MR); Market activity (MR) (DR)

Component Name	Description / Content	Visual Elements	Criteria
Bond Asset Card	Card that can be purchased by players	Text type of asset; Main visual; Icon for additional information (value, buy price, regular income)	Simulation (MR) (MS); Resources management (MR); Market activity (MR)(DR)
Cryptocurrency Asset Card	Card that can be purchased by players	Text type of asset; Main visual; Icon for additional information (value)	Simulation (MR) (MS) (MS); Resources management (MR); Market activity (MR) (DR)
Trading Asset Card	Card that can be purchased by players	Text type of asset; Main visual; Icon for additional information (value, buy price, sell price)	Simulation (MR) (MS); Resources management (MR); Market activity (MR)(DR)
Content Asset Card	Card that can be purchased by players	Text type of asset; Main visual; Icon for additional information (value)	Simulation (MR) (MS); Resources management (MR); Market activity (MR) (DR)
Culinary Business Asset Card	Card that can be purchased by players	Text type of asset; Main visual; Icon for additional information (value)	Simulation (MR) (MS); Resources management (MR); Market activity (MR) (DR)
Gold Fluctuation Card	Card opened each round to determine asset values	Gold visual; Nominal increase and decrease	Simulation (MR) (MS); Investment (MR) (MS); Market activity (MR); Speculation (MR)(DR)(DA)
Stock Fluctuation Card	Card opened each round to determine asset values	Stock visual; Detector/Prediction arrow (left); Barometer increase and decrease	Simulation (MR) (MS); Investment (MR) (MS); Market activity (MR); Speculation (MR)(DR)(DA)
Mutual Fund Fluctuation Card	Card opened each round to determine asset values	Mutual fund visual; Dice visual; Barometer increase and decrease	Simulation (MR) (MS); Investment (MR) (MS); Market activity (MR); Speculation (MR)(DR)(DA)
Cryptocurrency Fluctuation Card	Card opened each round to determine asset values	Cryptocurrency visual; Detector/Prediction arrow (right); Barometer increase and decrease	Simulation (MR) (MS); Investment (MR)(MS); Market activity (MR); Speculation (MR)(DR)(DA)
Content Fluctuation Card	Card opened each round to determine asset values	Content visual; Nominal increase and decrease	Simulation (MR) (MS); Investment (MR) (MS); Market activity (MR); Speculation (MR)(DR)(DA)
Culinary Business Fluctuation Card	Card opened each round to determine asset values	Culinary visual; Detector/Prediction arrow (left); Barometer increase and decrease	Simulation (MR) (MS); Investment (MR) (MS); Market activity (MR); Speculation (MR)(DR)(DA)
Insurance Card	Card that can be purchased to protect against detrimental events	Narrative text; Main visual; Price point icon	Simulation (MR) (MS)
Event Card	Card opened at the end of each round affecting all players	Narrative text; Main visual; Price and happiness point icons to be paid or received	Simulation (MR) (MS); Event (MS); Speculation (MR)(DR)(DA)
Donation Envelope	Envelope containing donations given by players	Description of endgame points: 1st place = 5 vp, 2nd place = 3vp, 3rd place = 3vp	Resources management (MR) (MS)
Beginner Mode Board	Accommodates fluctuation cards and price markers, consisting of:	Gold Board: Stock spot, Closed fluctuation deck spot, Open fluctuation deck spot, Price tracker	Simulation (MR) (MS); Market activity (MR)
		Stock Board: Stock spot, Closed fluctuation deck spot, Open fluctuation deck spot, Price tracker	Simulation (MR) (MS); Market activity (MR)
		Deposit Board: Stock spot	Simulation (MR) (MS); Market activity (MR)
Expert Mode Board	Accommodates fluctuation cards and price markers, consisting of:	Mutual Fund Board: Stock spot, Closed fluctuation deck spot, Open fluctuation deck spot, Price tracker	Simulation (MR) (MS); Market activity (MR)
		Cryptocurrency Board: Stock spot, Closed fluctuation deck spot, Open fluctuation deck spot, Price tracker	Simulation (MR) (MS); Market activity (MR)
		Bond Board: Stock spot	Simulation (MR) (MS); Market activity (MR)

Component Name	Description / Content	Visual Elements	Criteria
Small Business Mode Board	Accommodates fluctuation cards and price markers, consisting of:	Content Board: Stock spot, Closed fluctuation deck spot, Open fluctuation deck spot, Price tracker	Simulation (MR) (MS); Market activity (MR)
		Culinary Business Board: Stock spot, Closed fluctuation deck spot, Open fluctuation deck spot, Price tracker	Simulation (MR) (MS); Market activity (MR)
		Trading Board: Stock spot	Simulation (MR) (MS); Market activity (MR)
Bank and Insurance Board	Accommodates 3 types of transaction tools (currency/check) and insurance cards	Spot for currency/check; Spot for insurance card	Simulation (MR) (MS)
Entertainment Card Board	Accommodates entertainment cards and event cards	2 spots for entertainment cards; 2 spots for event cards (open and closed)	Simulation (MR) (MS)
Happiness Point Tokens	Small tokens to convert remaining money players have at the end of the game (60K/6 million = 1vp)	Happiness icon	Point/reward (MR)(MS)(DA); Scoreboard (MS)
Player Aid	Accommodates phases and options occurring in the game	Description of phase order; Description of available options	Onboarding (MR); Easy to learn (MS)
Rulebook	Accommodates game rules	Game rules; Scenarios	Onboarding (MR); Easy to learn (MS); Various strategy (MS); Discovery (DR); Emotions (DA); Storytelling (DA)

Note: In the code, the first letter represents: M (Mechanic); D (Dynamic); The last letter represents: A (Attention); R (Relevance);; S (Satisfaction).

Table S5. Component visual of avatar card

Aspect	Criteria	Description	Additional Information
Simulation	MR	Character visuals represent 10 personalities based on player archetypes with profiles of high school students or equivalent.	Number: 20 cards (10 male and 10 female)
	MS	Includes blank space for players to write names, professions, or nicknames as desired.	
Income	MR	Income logo 60, indicating each player will receive passive income (allowance) every round.	
	MS	Players experience satisfaction when receiving passive income (allowance) at the start of each round.	

Table S6. Item questions based on the ARCS model for student playtesting

No	Question
1	I have become interested in learning financial literacy (A)
2	This financial literacy game will be very useful for my personal life (R)
3	I feel very confident that I played well (C)
4	The elements of this game do not catch my attention(A)
5	The instructor/rulebook convinces me that the theme of this financial literacy game is important for me (C)
6	If I played well, it was just a coincidence (C)
7	This financial literacy game is too difficult to win (S)
8	The content of this financial literacy game is unrelated to any financial world I know before (R)
9	Whether I succeed or fail in this game depends on myself (C)
10	The instructor/rulebook makes the atmosphere tense while playing (A)
11	The core message of this financial literacy game is not easy for me to understand (C)
12	I enjoy this financial literacy game whether I win or lose (S)
13	Before this game started, I thought it required a lot of precision (A)
14	The points and scores given in this financial literacy game are fair enough (S)
15	Before this game started, my friends and I were very curious about it (A)
16	I feel happy playing this financial literacy game (S)
17	The instructor/rulebook does not provide clear instructions, so I am confused about what to do during the game (C)
18	I like the way the instructor/rulebook guides the game with me and my friends (S)
19	Through this financial literacy game, I learned many new things that I had not encountered before (S)
20	The content of this financial literacy game meets my expectations and goals (R)
21	The instructor/rulebook's explanation is interesting to follow (A)
22	My friends actively participate in this financial literacy game (R)
23	I will work hard to achieve my personal dreams (R)

No	Question
24	The instructor/rulebook gives tips for doing something unique and unusual during the game (A)
25	This financial literacy game is not useful for me personally (R)
26	I often daydream while the game is going on (A)
27	While playing, I believe I will succeed if I try my hardest (C)
28	This game will be very useful in my personal life in the future (R)
29	Just by looking at the packaging and title, I am interested in playing (A)
30	In my opinion, the complexity level of this game is appropriate (C)
31	I feel somewhat disappointed with this game (S)
32	After playing, I receive feedback or conclusions on my performance (S)
33	The amount of work required in this game is just right, not too much or too little, for the theme of financial literacy (S)
34	In my opinion, the feedback given on my performance adequately reflects how well/badly I played (C)