



Article

# Enhancing Children's Insurance-Related Knowledge and Learning Attitudes Through Digital Game-Based Learning

Mengping Tsuei<sup>1</sup>, Hui-Chun Lu<sup>1</sup>

<sup>1</sup> Graduate School of Curriculum and Instructional Communications Technology, National Taipei University of Education, Taipei, Taiwan  
[mptsuei@mail.ntue.edu.tw](mailto:mptsuei@mail.ntue.edu.tw); [chelsea.hc.lu@hotmail.com](mailto:chelsea.hc.lu@hotmail.com)

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**Abstract**

This quasi-experimental study was conducted to explore the effects of the application of a digital game-based learning (DGBL) approach in insurance education on elementary-school students' learning. A digital role-playing game was developed and used in a 4-week insurance education intervention involving 58 sixth-graders in an elementary school in Taiwan. Students in the experimental group learned insurance-related concepts by playing the game, whereas those in the control group received traditional instruction. Learning achievement was significantly better in the experimental group than in the control group, especially for female and low-achieving students. No significant difference between groups was observed for high-achieving students in learning achievement. Scores reflecting students' attitudes toward insurance education were significantly higher in the experimental group than in the control group. Female and low-achieving students in the experimental group outperformed those in the control group in overall learning attitude, motivation, self-efficacy and learning approach; male and high-achieving students had higher scores only for the learning approach. Our findings support the effectiveness of DGBL in insurance education for elementary-school students and highlight implications for teachers' integration of DGBL into insurance instruction for children.

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## 1. Introduction

Financial literacy has become an essential skill in today's increasingly complex financial environment. The Organisation for Economic Co-operation and Development incorporated financial literacy into the framework of its Programme for International Student Assessment in 2012 [1]. Retzmann and Seeber [2] stressed that financial education must be treated as a proper subset of economic education. Financial education curricula cover various competencies, including insurance, risk management and financial risk, and should share consistent standards [3]. Financial literacy refers to an individual's knowledge and understanding of financial concepts such as budget management, investment, loans and insurance [4]. The concept of insurance is included in the National Standards for Financial Literacy [5] of the United States'

Council for Economic Education (CEE), which aim to guide students' learning about how to protect themselves from the financial risks of lost income, assets, health and/or identity. Insurance allows people to transfer risk by paying a fee to avoid the possibility of a larger loss later. However, a previous study indicated that most teachers do not have sufficient basic knowledge to teach financial literacy competencies [6].

Atkinson and Messy [7] indicated that most teachers adopt a flexible approach to the integration of financial education into curricula, and may decide not to include aspects of financial literacy. Lack of available guidance and resources for teachers' implementation of financial literacy programmes have become a key issue for the enhancement of the effectiveness of financial education and should have a decisive influence on student achievement [8]. The CEE has responded to increased demands for financial education in schools by publishing instructional materials and supporting teacher workshops on topics in personal finance [9]. However, most teachers report that they lack financial literacy education resources [10]. They prepare lessons to incorporate such education using available resources, such as play money, videos and books. Amagir et al. [11] indicated that most financial literacy resources have been developed for high-school and college students, and that few are available for middle- and elementary-school students. Thus, more resources for teachers to integrate into financial literacy instruction are needed.

Studies of the effectiveness of the implementation of instructional strategies incorporating different learning resources in financial curricula have yielded inconclusive results. These studies were diverse in terms of their duration, timing, content, design and level of students involved [12, 13]. Amagir et al. [11] reviewed 36 studies of financial literacy programmes published between 2004 and 2015, and reported small to medium positive effects of these programmes on financial knowledge, behaviour and attitudes. A recent study revealed that financial education programmes increase high-school students' interest in financial matters and likelihood to make proactive financial choices [14]. Johnson et al. [15] invited 68 middle-school teachers to use FutureSmart modules in their financial education courses for 6 months. These modules are online resources that utilise a 'story-based narrative'; students role play as the mayor of a fictional town and help local citizens make real-life financial decisions [16]. The intervention significantly increased students' financial knowledge, but had no effect on their financial attitudes or behaviour [15]. Liu, Ho and Chueh [17] developed an interactive transactional system that simulates stock market trading for university students, and found that students gained financial knowledge through its use, boosting their financial literacy. Thus, although some studies have shown that financial education improves students' financial literacy [11], most have been conducted with young adults or in adult educational settings. Few interventions have been developed specifically for elementary-school students [15].

Instructional strategies play important roles in effective financial learning. Mandell and Klein [18] indicated that the incorporation of computer-based interactive financial education is a promising approach that could contribute to the expansion of students' financial knowledge. They found that students who participated in the Stock Market Game gained more financial literacy than those who did not, and suggested that the incorporation of such interactive activities at a younger age could have positive impacts on students' financial knowledge gains [18].

Financial literacy education should start as early as in elementary school, and be repeated in secondary school and college [11]. An increasing number of recent studies has demonstrated the effectiveness of digital game-based learning (DGBL) in various subject areas in elementary schools. Games can help students build knowledge and cognitive skills by providing them with problems and challenges in virtual world settings. In this way, learning is contextualised and situated [19]. Evidence for the effectiveness of GBL in the area of financial literacy remains very sparse, although much is known about the general potential of this approach. Comparing with traditional approach, studies suggest that GBL is more effective with regard to knowledge

acquisition and the duration of knowledge retention [20], and that it provides more motivation and contributes to interest development [21]. However, research on the potential of DGBL for children's insurance education is extremely limited.

In this study, a digital role-playing game (RPG) for elementary-school students' learning of insurance-related concepts was designed, and its effects on children's acquisition of these concepts and attitudes toward insurance education were investigated. This approach could open up new perspectives regarding the use of DGBL in insurance education for children.

The following research questions were investigated:

1. Can the DGBL approach improve elementary-school students' learning of insurance-related concepts in comparison with conventional instruction?
  - 1.1 Are there gender differences in the learning of insurance-related concepts?
  - 1.2 Are there differences between high- and low-achieving students in the learning of insurance-related concepts?
2. Can the DGBL approach improve elementary-school students' attitudes toward insurance education in comparison with conventional instruction?
  - 2.1 Are there gender differences in students' attitudes toward insurance education?
  - 2.2 Are there differences between high- and low-achieving students' attitudes toward insurance education?

## 2. Literature Review

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### 2.1 Financial education

Research suggests that primary-school children are capable of understanding basic economic concepts and managing money, and can thus be taught about personal finances [22, 23]. The CEE's National Standards for Personal Financial Education cover six main topics: earning income, spending, saving, investing, managing credit and managing risk [24]. Insurance-related concepts are the main components of the managing risk topic. Students learn the basics about insurance, including common terms and how their behaviour can affect the premiums they pay. At the elementary-school level, students learn to cope with unexpected losses and save for emergencies. They also learn that insurance is often purchased to limit financial losses due to risk [24]. The curriculum design and course content play important roles in education on risk management and insurance. However, most relevant studies have focused on universal and college-level education. For example, Dorfman et al. [25] indicated that 'principles' and 'risk management' courses are widely considered to be the most important core courses for this education. They also indicated that other courses identified as highly desirable electives cover employee benefits, property insurance, liability and casualty insurance, and life insurance. Dorfman et al. [25] suggested that the value of insurance education could be improved by the implementation of a well-designed curriculum by well-trained teachers.

Batty et al. [26] implemented a programme adapted from the CEE's Financial Fitness for Life curriculum for students aged 9–10 years (fourth- and fifth-graders) in 71 classrooms and found that it improved students' financial knowledge relative to a control group, with large effect sizes. Moreover, they observed continuity in students' financial knowledge and behaviour beyond the immediate post-instruction period [26]. Supanantarook et al. [27] collaborated with a local Aflatoun partner to implement a 3-month financial education programme with 1,746 fifth- and sixth-grade students in Uganda. The programme involved 1 hour of teaching and 1 hour of activities on the topics of saving and enterprise development per week, and it positively affected students' saving attitudes and behaviours [27]. Dare et al. [28] implemented two modules of a financial education programme with 2,560 fifth-grade students in the Netherlands. The 'responsible spending' module covered topics such as making choices with a limited budget, the effects of peer pressure and advertising, and the estimation

of product prices [28]. The ‘performing transactions’ module acquainted the students with cash and digital money, encouraged their development of a proactive attitude toward money matters, and taught them about the security features of money [28]. The performing transactions module increased students’ knowledge and skills, but the responsible spending module did not [28]. Pfändler [29] designed the Happy Life financial literacy board game for young students. The game’s narrative covers the years of life from young adulthood through employment and retirement [29]. Players encounter decision-making situations with financial consequences and must apply their financial knowledge to solve problems, improving their financial competence [29]. A pilot study conducted with five participants aged 18–27 years showed that individuals attain a flow state (characterised by high levels of concentration, absorption, motivation and commitment) while playing the game, have fun and deal actively with relevant financial literacy objects [29]. These results led the author to conclude that the game was a good resource for the target group, but to note that an intervention study was needed to test its effectiveness [29].

## 2.2 Game-based financial education

Gamification and GBL have been used recently to facilitate learning, especially in high schools and universities [30]. The use of games to deliver educational content makes learning enjoyable for students, helping them to develop interest and making knowledge acquisition a joyful process [19]. Thus, games create an effective learning environment that allows learners to feel relaxed and motivated to enhance their learning. Costin, O’Brien and Slattery [31] and Suh et al. [32] recommend that organisations consider gamification as a viable strategy to promote informal learning and reinforce financial literacy. Grogan [33] indicated that classroom games provide students with a thorough understanding of some insurance policy options under debate.

Serious games are used in the financial services corporate environment. Economy, a serious game based on the monetary policies of the European Central Bank, is used to teach employees about the impacts of interest rate changes on unemployment, output growth, inflation and other vital economic indicators [34]. Bankers Lab provides game-based products for employee training in the retail banking industry.

Reuter et al. [34] created a framework and model of game design principles for application in financial education. The elements include goal setting, user engagement, financial knowledge, financial attitudes, financial behaviour and additional competencies (e.g. critical analysis and problem solving) [34]. They also recommended the integration of questions, puzzles and challenges into games, and experimentation with the type of overall reward, characters and art style [34]. However, they noted the need for classroom experiments to support their recommendations [34].

Hazlett [35] conducted a classroom experiment on the topic of deposit insurance, in which students acted as bankers creating loans with their own money and hypothetical money from depositors. The teachers followed the activity by asking a set of questions, and the students worked in small groups to analyse the risk-taking incentives they faced as potential bank owners and discuss the implications for society [35]. Whereas health insurance-related activities usually demonstrate adverse selection, this activity demonstrated moral hazard, with banks providing riskier loans when insured [35]. Thus, this GBL implementation demonstrated why bank owners want lower equity requirements and the burden of such requirements for the public [35].

James and Champlin [36] designed an online interactive game based on real-world stories about personal struggles with health insurance that they had gathered from community members, undergraduate students and the national news. They developed five scenarios in which key details about what happened and what went wrong for the clients were presented and health insurance terms were then provided [36]. Seventy-two university students played

this game and completed a survey before and after game play [36]. They self-reported increased understanding of how to use health insurance and of critical health insurance terminology after game play, but no significant difference in their understanding of what health insurance is [36]. These findings suggest that the game effectively improves players' knowledge about health insurance, with the largest increase in correct definitions of insurance-related terms [36].

Grogan [33] designed a classroom game with four scenarios about insurance. The course instructor acted as the insurer and used an Excel spreadsheet to record insurance participation, calculate costs and update premiums [33]. The 13 university students who participated in the study received a lecture on risk and uncertainty that included standard material on the calculation of expected values, expected utilities and certainty equivalents [33]. At the conclusion of the activity, the instructor led a 20-minute discussion about the implementation of health care reform with the aim of tying in important concepts of risk that had been discussed [33]. The game helped to solidify students' concepts of risk and expected value [33].

In sum, most financial education games developed to date are board games for use in classroom settings. As the use of DGBL for various subjects has increased, computer-based risk management games have allowed students to simulate experiences of loss and understand the effects of various risk management strategies on firms [33]. However, the availability of a wide range of digital games that promote financial literacy stands in contrast to a gap in research on their effectiveness [37]. Moreover, evidence-based studies involving the development and assessment of digital games in insurance education for elementary-school students are lacking.

### 3. The Knight Arthur Role-Playing Insurance Game

RPG Maker MV was used to develop an insurance education RPG for children called 'Knight Arthur', with learning materials and game rules modules. According to the curriculum guidelines of Taiwan's Financial Supervisory Commission [38], the learning materials module contains three units covering insurance-related concepts: 'understanding risks', 'risk sharing', and 'understanding insurance' (Table 1).

**Table 1.** Insurance concepts covered in the Knight Arthur game

Learning unit	Objectives
Understanding Risks	1. Understanding two types of risks: (1) Personal Risks (2) Property Risks 2. Knowing how to handle risks: (1) Avoiding Risks (2) Reducing Risks (3) Transferring Risks to Reduce Losses (4) Assuming Risks
Sharing Risks	1. Understanding the characteristics of insurance as 'Mutual Aid' 2. Understanding the significance and functions of insurance: (1) Principles of Insurance Formation (2) Functions of Insurance
Understanding Insurance	1. Familiarizing three types of insurance: (1) Social Insurance (2) Government Insurance (3) Commercial Insurance 2. Being able to choose appropriate insurance: (1) Planning different protections according to different life stages and budgets (2) Choosing reputable insurance companies

The game rules module guides the execution of the game's elements, including challenges, battles and treasure hunts. Each player controls a character. The game's storyline revolves around the principal student-played character of a knight in a virtual world who assists the Earl

in achieving various learning objectives to defend the estate. The player is introduced to the background story through an animation in which the knight, named Arthur, enters a world map with four areas: 'The Count's Castle', 'Fishing Village', 'Forest Town', and 'Demon Castle'. Arthur must first visit The Count's Castle to obtain the Count's decree and basic insurance coverage. Only then can he proceed to the Fishing Village, which corresponds to the 'understanding risks' learning unit. The Forest Town and Demon Castle correspond to the second and third learning units, respectively. During game play, non-player characters (NPCs) provide Arthur with various types of information, including the location of a store offering a safety platform where he can purchase insurance, guidance on the game's direction, learning sessions and tasks based on different contextual stories.

An example of the game interface is shown in Figure 1. In this scenario, Arthur encounters the grandson of a drowning grandmother and must select one of the options displayed on the screen to indicate how the grandmother should be rescued. In the 'avoiding risks' portion of the game, the player must select the action that can help to prevent injuries from the options displayed. The player must answer questions correctly to achieve victory in battles, defeating enemies and collecting crystals (which serve as the scoring system; Figure 2). When an answer is incorrect, an explanation of why it is wrong is displayed, providing the player with correct knowledge.

The player must collect eight crystals in each learning unit. The mission is failed when the cumulative number of incorrect answers reaches three. In such cases, the player must return to The Count's Castle to review the learning materials.

As the game progresses, the player's equipment is upgraded based on the number of tasks completed. The player must follow the game rules and answer questions posed by NPCs to complete the tasks and accumulate crystals and consumable items (e.g. coins and magic potions). These items can be used to enhance the knight's defensive and offensive (attack) capabilities. The goal is achieved when the knight completes all of the assigned tasks.

Two combat modes are provided in the game: a standard mode in which lower-level monsters with lower scores are battled, and an enhanced mode with additional questions in which monsters alternately attack and deduct time from the player's life. When the player's life is reduced to zero, he or she fails the task.



**Figure 1.** Screenshot of the Drowning Mission ('knowing how to handle risks'). The selection screen shows three choices that the player can take with respect to the drowning grandmother: 'ignore her', 'throw a lifebuoy to her and call an ambulance', and 'jump in to save her'.





**Figure 2.** Screenshot of the 'avoiding risks' portion of the game. The question 'Which of the following actions can help prevent injuries?' and options of '1. Running on campus', '2. Riding a bicycle against traffic', '3. Playing jump rope with classmates in the hallway' and '4. Taking a detour around a construction site' are displayed.

## 4. Methods

### 4.1 Participants

We conducted a quasi-experimental study at an elementary school in an urban area of northern Taiwan to investigate the effectiveness of the Knight Arthur game. Two sixth-grade classes ( $n = 41$ ; 24 boys and 17 girls) were assigned to the experimental group and one sixth-grade class ( $n = 17$ ; 7 boys and 10 girls) served as the control group. The students' average age was 12 years, and they had not previously been taught insurance-related concepts in the classroom. The same teacher with more than 8 years of experience taught all classes.

### 4.2 Instruments

#### 4.2.1 Insurance Concepts Test

The Insurance Concepts Test used in this study was adapted from the risk management and insurance education materials of Taiwan's Financial Supervisory Commission [38]. The test comprises 20 questions in three domains: understanding risks, sharing risks and understanding insurance. Two experienced primary-school teachers reviewed and edited the test. The overall difficulty of the test was .54, and the discrimination index was acceptable (.24). The internal consistency and reliability of the test were found to be excellent (Cronbach's  $\alpha = .98$ ).

#### 4.2.2 Insurance Education Attitude Scale

Changes in students' attitudes toward insurance education were explored using a scale adapted from the instrument used by Yu and Tsuei [39]. The Insurance Education Attitude Scale has three domains: learning motivation (11 items), self-efficacy (8 items) and learning approach (6 items). Responses are structured by a 5-point Likert scale. Two experienced primary-school teachers reviewed and edited the scale. It showed excellent internal consistency and reliability (Cronbach's  $\alpha = .97$ ).

### 4.3 Experimental procedure

In the first week of the study, the Insurance Concepts Test was administered to all participating students. In the subsequent intervention phase, insurance education covering the test domains was delivered in one 40-minute session per week for 4 weeks. At the beginning of each session, the teacher provided a brief explanation of the session's objectives.

In the first week of the study, the teacher introduced and explained the operation of a tablet and the Knight Arthur game to the students in the experimental group. These students then used the game as a learning tool. The control group received traditional instruction delivered by the teacher using PowerPoint presentations and videos. All groups were provided with worksheets,

and students were allotted 20 minutes to complete them. Throughout the sessions, the teacher encouraged the students to provide explanations of and feedback on the insurance-related concepts. The same learning content (including tasks and problem explanations) was provided to all students.

After the intervention, the Insurance Education Attitude Scale and Insurance Concepts Test were administered to all students.

#### 4.4 Data analysis

Descriptive and inferential statistical analyses of the data were performed. One-way analysis of covariance (ANCOVA) was used to evaluate the learning achievement of students in the two groups. The independent-samples *t* test was used to explore differences in students' post-intervention attitudes toward insurance education between groups. The Mann–Whitney *U* test was used to examine differences in the dependent variables between genders and according to learning achievement.

## 5. Results

### 5.1 Students' learning of insurance-related concepts

According to the assumptions that must be met for valid ANCOVA [40], the homogeneity of the regression coefficients was first examined. The slopes of the regression lines for the two study groups were similar, confirming the assumption of homogeneity and suitability of ANCOVA ( $F = 2.04, p > .05$ ). Levene's test indicated that the error variance was homogeneous across groups. The mean total Insurance Concepts Test score was higher in the experimental group than in the control group ( $M^a = 77.33$  vs.  $68.06$ ;  $F = 10.59, p < .01$ ; Table 2). Students in the experimental group also significantly outperformed those in the control group in the sharing risks domain ( $M^a = 17.94$  vs.  $15.34$ ;  $F = 4.38, p < .05$ ; Table 2). No significant difference between groups was observed in the understanding risks or understanding insurance score ( $F = 1.92$  and  $3.91$ , respectively).

**Table 2.** Mean Insurance Concepts Test scores ( $N = 56$ )

Factor	test	EG (n=40)			CG (n=16)			<i>F</i>
		<i>M</i>	<i>SD</i>	<i>M<sup>a</sup></i>	<i>M</i>	<i>SD</i>	<i>M<sup>a</sup></i>	
Overall score	Pre-test	60.60	13.51	77.33	65.69	9.96	68.06	10.59**
	Post-test	76.43	12.43		70.50	14.21		
understanding risks	Pre-test	12.60	3.97	17.94	15.00	3.10	15.34	1.92
	Post-test	13.80	3.65		13.69	3.95		
sharing risks	Pre-test	12.60	3.97	17.94	17.25	3.87	15.34	4.38*
	Post-test	17.78	4.15		15.75	4.58		
understanding insurance	Pre-test	32.63	8.01	44.97	33.44	6.75	40.75	3.91
	Post-test	44.85	8.53		41.06	7.40		

EG, experimental group; CG, control group; *M*, mean; *SD*, standard deviation; *M<sup>a</sup>*, Adjusted mean. \* $p < .05$ , \*\* $p < .01$ .

The post-intervention mean total Insurance Concept Test score was significantly higher for girls in the experimental group than for those in the control group ( $77.00 \pm 11.37$  vs.  $68.70 \pm 16.49$ ;  $Z = -2.69, p < .01$ ; Table 3). No significant difference was observed between boys in the two groups.



**Table 3.** Mean Insurance Concepts Test scores by gender

Gender	test	EG		CG		U	Z
		M(n=23)	SD	M(n=6)	SD		
Boys	Pre-test	61.96	15.07	67.67	8.64	37.00	-1.73
	Post-test	75.87	13.57	73.50	9.94		
Girls	Pre-test	64.24	10.79	67.50	9.37	31.50	-2.69**
	Post-test	77.00	11.37	68.70	16.49		

EG, experimental group; CG, control group; M, mean; SD, standard deviation. \*\* $p < .01$ .

Based on pre-intervention Insurance Concept Test scores, the students were divided into high-achieving (upper 50% of scores) and low-achieving (below top 50% scores) groups. The post-intervention mean total Insurance Concept Test score was significantly higher for low-achieving students in the experimental group than for those in the control group ( $68.60 \pm 11.34$  vs.  $60.38 \pm 11.84$ ;  $Z = -3.26$ ,  $p < .01$ ; Table 4). No significant difference was found between high-achieving students in the two groups ( $Z = -.89$ ).

**Table 4.** Mean Insurance Concepts Test scores by learning achievement

Group	test	EG		CG		U	Z
		M(n=20)	SD	M(n=8)	SD		
LA	Pre-test	52.40	8.62	61.00	7.07	16.00	-3.26**
	Post-test	68.60	11.34	60.38	11.84		
HA	Pre-test	73.45	7.48	74.13	4.22	62.50	-.89
	Post-test	84.10	8.23	80.62	7.62		

EG, experimental group; CG, control group; M, mean; SD, standard deviation; LA, low-achieving students; HA, high-achieving students. \*\* $p < .01$ .

## 5.2 Students' attitudes toward insurance education

The mean total Insurance Education Attitude Scale score was higher in the experimental group than in the control group ( $4.52 \pm 0.58$  vs.  $3.71 \pm 0.67$ ;  $t = -4.52$ ,  $p < .001$ ; Table 5). Relative to the control group, students in the experimental group also had significantly higher learning motivation ( $t = -3.99$ ,  $p < .001$ ), self-efficacy ( $t = -3.61$ ,  $p < .01$ ) and learning approach ( $t = -7.29$ ,  $p < .001$ ) scores (Table 5).

**Table 5.** Mean Insurance Education Attitude Scale scores ( $N = 57$ )

Factors	EG (n=41)		CG (n=16)		t
	M	SD	M	SD	
Overall	4.52	0.58	3.71	0.67	-4.52***
learning motivation	4.47	0.65	3.72	0.68	-3.99***
self-efficacy	4.46	0.63	3.77	0.73	-3.61**
learning approach	4.70	0.53	3.62	0.73	-7.29***

EG, experimental group; CG, control group; M, mean; SD, standard deviation. \*\* $p < .01$ , \*\*\* $p < .001$ .

No significant difference in the total Insurance Education Attitude Scale score was observed between boys in the experimental and control groups. Boys in the experimental group had significantly higher learning approach scores than did those in the control group ( $Z = -2.67$ ,  $p < .05$ ; Table 6). Insurance Education Attitude Scale total and domain scores were higher for girls in the experimental group than for those in the control group (total:  $Z = -3.78$ ,  $p < .001$ ; learning motivation:  $Z = -3.44$ ,  $p < .01$ ; self-efficacy:  $Z = -2.61$ ,  $p < .01$ ; learning approach:  $Z = -4.43$ ,  $p < .001$ ; Table 6).

**Table 6.** Mean Insurance Education Attitude Scale scores by gender

Gender	Factors	EG		CG		U	Z
		(n=24)		(n=6)			
Boys		M	SD	M	SD		
	Overall	4.53	0.63	4.19	0.86	48.50	-1.24
	learning motivation	4.54	0.72	4.33	1.03	67.00	-0.31
	self-efficacy	4.54	0.72	4.17	0.98	56.50	-0.94
	learning approach	4.79	0.59	4.00	0.89	34.00	-2.67**
Girls		(n=17)		(n=10)			
		M	SD	M	SD		
	Overall	4.51	0.52	3.43	0.32	10.00	-3.78***
	learning motivation	4.47	0.72	3.30	0.48	20.50	-3.44**
	self-efficacy	4.47	0.62	3.70	0.68	37.00	-2.61**
	learning approach	4.82	0.39	3.30	0.48	4.50	-4.43***

EG, experimental group; CG, control group; M, mean; SD, standard deviation. \*\* $p < .01$ , \*\*\* $p < .001$ .

Low-achieving students in the experimental group had significantly higher Insurance Education Attitude Scale total and domain scores than did low-achieving students in the control group (total:  $Z = -3.59$ ,  $p < .001$ ; learning motivation:  $Z = -3.01$ ,  $p < .01$ ; self-efficacy:  $Z = -3.29$ ,  $p < .01$ ; learning approach:  $Z = -4.74$ ,  $p < .001$ ; Table 7). The learning approach score was significantly higher for high-achieving students in the experimental group than for those in the control group ( $Z = -2.97$ ,  $p < .05$ ); no significant difference in the total, learning motivation, or self-efficacy score was observed between these groups ( $Z = -1.90$ ,  $-1.75$ , and  $-0.75$ , respectively).

**Table 7.** Mean Insurance Education Attitude Scale scores by learning achievement

Group	Factors	EG		CG		U	Z
		(n=20)		(n=8)			
		M	SD	M	SD		
LA	Overall	4.57	0.50	3.36	0.52	10.0	-3.59***
	learning motivation	4.50	0.69	3.38	0.74	25.0	-3.01**
	self-efficacy	4.60	0.31	3.13	0.74	20.5	-3.29**
	learning approach	4.90	0.50	3.36	0.35	1.00	-4.74***
		(n=20)		(n=8)			
		M	SD	M	SD		
HA	Overall	4.55	0.57	4.07	0.64	43.00	-1.90
	learning motivation	4.60	0.68	4.00	0.93	50.00	-1.75
	self-efficacy	4.50	0.69	4.38	0.52	67.00	-0.75
	learning approach	4.80	0.52	4.00	0.76	32.00	-2.97*

EG, experimental group; CG, control group; M, mean; SD, standard deviation; LA, low-achieving students; HA, high-achieving students. \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

## 6. Discussion and Conclusions

The current study extended previous research, with the examination of the effects of an RPG game on elementary-school students' knowledge of insurance-related concepts and attitudes toward insurance education. The game significantly improved students' knowledge of insurance-related concepts relative to the control group. This finding provides evidence that DGBL is an effective instructional strategy, facilitating elementary-school students' acquisition of insurance knowledge, especially regarding concepts related to the sharing of risks. Our results are consistent with the previous finding that real-life example practice in insurance instructions improves the effectiveness of students' learning [28].

In this study, girls in the DGBL group benefitted more and had more positive attitudes toward insurance education than did girls in the control group. This result is consistent with the previous finding that health insurance literacy and gains therein are greater among females than males [41]. This phenomenon may reflect females' tendency to perceive greater risks than do males, due to natural and cultural factors. For example, women tended to be more risk averse than men in the early days of the COVID-19 epidemic in Taiwan [42]. In addition, girls seem to engage more with DGBL than do boys [43]. Boys prefer to play action games, whereas girls prefer to play

virtual, simulation and puzzle games [44]. Moreover, female students demonstrated better DGBL with self-explanation than did males, potentially leading to greater learning gains [44]. Our result also aligns with Joiner et al.'s [45] finding that female learners prefer games involving exploration and themed tasks, as Knight Arthur game players explore the four areas of the game's world as the knight Arthur and must answer insurance-related questions. Thus, this RPG likely provided more motivation for female than male students to become active learners.

Low-achieving students in the experimental group had significantly better learning achievement and attitudes than did their counterparts in the control group in this study. We found that these students were very active in answering questions while playing the game. The immediate feedback that the game provided about whether responses were correct and where players had made mistakes likely helped low-achieving students consolidate their knowledge and strengthen their confidence [46]. This feedback also enables students to monitor their progress and directs them to move forward, which are especially helpful for low-achieving students [47]. These results are in line with the finding that metacognitive training and cognitive prompting embedded in a simulation game helped players acquire knowledge [48]. Digital games have the potential to engage students with meaningful and authentic contexts and motivate low-achieving students by enabling exploration without the fear of failing in front of the entire class [49]. Thus, the mechanics of the Knight Arthur game likely played important roles in the facilitation of low-achieving students' motivation and learning. The performance- and completion-contingent reward approaches positively affect different aspects of children's learning in the DGBL context. Overall, these results confirm that educational games can play a crucial role in the reinforcement of children's learning by actively engaging them in the process [50].

The results of this study have implications for teachers delivering insurance education. First, the RPG used in this study helped students, and especially low-achieving students, improve their performance and attitudes toward insurance education. We encourage teachers to consider employing DGBL strategies for classroom insurance education, especially for elementary-school students. During game play, teachers can observe students' task performance and difficulty with particular content. After game play, they can lead discussions with students in which they highlight connections between the game and curriculum contents [51]. Second, several characteristics of the game that enhanced students' learning were identified in this study: the provision of specific tasks, the immediate provision of feedback and information, and the incorporation of various challenge levels (i.e. battles and treasure hunts). Teachers can also facilitate students' motivation by supplementing DGBL with different reward strategies in classroom contexts. Third, educators need to advocate for the recognition of insurance education as an important and distinct area of learning or integrate insurance-related concepts into various areas of learning using DGBL approaches.

This study provides important contributions to the literature on the use of DGBL in children's insurance education. However, several limitations should be noted. First, the Knight Arthur game has only three learning units; units covering additional insurance-related concepts need to be developed and validated in future research. Second, longitudinal research is needed to examine students' long-term retention of financial literacy and skills to strengthen the impact of the study findings. Third, only three classes of students in a single school participated in our study. In future research, the sample size and diversity should be increased. In addition, more qualitative data are needed for the comparison of DGBL and traditional instruction in insurance education. Lastly, research is needed to replicate the findings of this study and further examine the effectiveness of DGBL on children's insurance learning.

## Conflicts of interest

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The authors have no conflicts of interest to declare.

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