

E-ISSN: 2469-6501 **VOL: 8, ISSUE: 11** November/2022 DOI: http://dx.doi.org/10.33642/ijbass.v8n11p1



https://creativecommons.org/licenses/by/4.0/

Pre-service Training for Students' Coping Capacity in the Workplace through Research and Development of an E-store Game-based Education System

**Ting-Sheng Weng** 

Department of Business Administration National Chiayi University No.300 Syuefu Rd., Chiayi City 60004, Taiwan Email: politeweng@yahoo.com.tw

Taiwan

### ABSTRACT

The pre-service education systems and research papers about level games, which give automatic answers and instant evaluation, are scarce. The system developed in this study could timely judge whether the answers chosen by students are right or wrong when they try to pass game levels and automatically provide the correct answers. In this study, learning units, such as store management practice, circulation management, and mathematics, were comprehensively designed into an animated game for students to play as new employees before beginning employment. Furthermore, the students were allowed to experience the problems and situations that shop service staff may encounter in the workplace. In this way, the students could increase their knowledge and experience instore operation and customer relationship management in the workplace in advance. Thereby, the students could give better spontaneous responses after entering the workplace in the future. By using the level game designed by this study, students could also improve their service efficiency and professionalism, including store management and operation, as well as the intuition and insight of estimation and number sense ability. This level game contributes to pre-service education.

### Keywords: pre-service education; level game; instant judgment; automatic answer; store management; mathematics

#### 1. Introduction

With changes in industries, society, and times, technical and vocational education has cooperated with industries, taken root in the local area, and gone global through the promotion of education policies and industrial connections. The major policies of technical and vocational education have a critical influence on training future talents (Chung & Hsu, 2018). In the past, technical and vocational education cultivated countless entry-level technical talents, which contributed greatly to Taiwan's economic and social development. Over recent years, with the rapid changes in the economy and social structure, Taiwan's industrial structure has also changed. Now, Taiwan faces the outflow of labor-intensive industries. The output value of Taiwan's service industry and its proportion of employees have exceeded those of the manufacturing industry. In addition to the low birth rate, changes in the hierarchical structure of manpower and different demands for workplace capabilities can also be observed. Therefore, Taiwan is encountering many issues and challenges in technical and vocational education (Hsu & Chung, 2022).

Since the implementation of educational reform in Taiwan, the tertiary education system and the technical and vocational education system have suffered enormous shocks. All sectors of society have divergences of opinions on the purpose and effectiveness of school education. With the changes in industries, the knowledge learned in schools may not catch up with the progress of the times and meet the demand of industries. Some vocational colleges have industry-university collaboration programs, in which cooperative courses are set up to conduct convenience store workplace. The level game is expected to cultivation, workshops, discussions, internships, or training of provide students with simulation experiences before internship or

their students (Ministry of Education, 2017). However, the number of learning hours allocated for learning operating techniques and customer service is still limited, which is unlikely to benefit students' employment and career life after graduation. Especially in the field of technical and vocational education, whether students can apply what they have learned has become the focus of external inspection (Ministry of Education, 2018a). Hence, this study developed an appropriate customer knowledge system for storage services in the way of game learning, which students prefer.

#### 2. Research Motivation and Purposes

Taiwan's Ministry of Education (2019) stipulated that technical and vocational education should provide students with the professional knowledge, skills, and ethics required for entering the workplace and foster a sense of honor for the professions in which students are majoring. The purpose of this stipulation is primarily to supply the industrial talent. However, in Taiwan, the goal of mainstream education is to gain admission to universities. If students in vocational high schools do not have practical experience in stores related to business services, they will likely be unfamiliar with the actual on-site business service model. To have work experience in advance, they should first understand what problems they will face in working and how to address these issues best. However, the pre-service education systems and research papers about level games, which give automatic answers and instant evaluation, are rare. Therefore, the purpose of this study is to design a game to simulate the customer service interactions that may be encountered in the



E-ISSN: 2469-6501 VOL: 8, ISSUE: 11 November/2022 DOI: <u>http://dx.doi.org/10.33642/ijbass.v8n11p1</u>

 $\odot$ 

https://creativecommons.org/licenses/by/4.0/

employment for the acquirement of number sense skills and sensitivity regarding workplace situations, to help them integrate into the social workplace quickly and easily.

Currently, few systems can offer students the experience of serving customers and operating and managing stores by using animation games, and few systems can automatically detect whether answers are correct or not. Therefore, a learning outcome assessment system in the form of level games about communicating with customers when providing services in convenience stores was developed as a pre-service education channel.

#### **3. Literature Review**

# 3.1 Internships in commercial services and work-study programs

Students often apply at stores for internships during their studies or work in the workplace after graduation, to accumulate occupational experience. Although the professional knowledge in textbooks is important, the knowledge obtained in various professional disciplines can be made full use of in the workplace when handling on-site affairs and problems. In other words, it is important to be able to apply knowledge from textbooks to the workplace.

The Ministry of Education (2013) has advanced the concept of cooperative education in vocational high schools and requires these schools to establish cooperative education with institutions so that their students can receive vocational skills training. However, most students in Taiwan's technical and vocational education system prefer to continue their higher education after graduation rather than begin employment (Pan and Liu, 2019; Wu, 2020). The limited time for on-spot vocational skills training may affect the sound development of their technical and vocational education, resulting in a gap in the students' vocational skills.

Off-campus internships are an extension of the oncampus curriculum. They assist students in understanding workplace life in advance, obtaining practical knowledge and experiences, and developing the correct professional attitude and ethics, through the thoughtful internship curriculum planning of colleges and the favorable internship platforms offered by industries. In addition, students can be allowed to learn about the current situation of industries through internships, stimulate their learning motivation, and explore future career plans (Ministry of Education, 2018a).

The Ministry of Education (2018b) formulated the (Van den Heuvel-Panhuizen & Buys, 2008). (2) Conversions are Implementation Measures for Internship Courses in Senior High Schools for vocational senior high schools. About on-campus describe the estimated results (Montague & Van Garderen, 2003). (3) Mental imagery refers to recalling previous measurement experiences, finding benchmarks, and employing the previous internships, for the calculation of credits for each subject, one if the total number of classes in one semester reaches 18. As for off-campus internships, only the students with 72 hours of practice can gain one credit. A maximum of two credits per semester can be awarded during an internship. However, the internships arranged by schools are likely to be conducted in proceeding and then using this proceeding to be conducted in proceeding and then using this proceeding and then using the proceeding and the proceedin

certain commercial shops they usually collaborate with. They may be performed in a fixed time range of one to two hours, have several students practice in batches, or even have a single student work while other students observe from the sidelines. However, commercial stores encounter diverse people and situations, and their corresponding handling mechanisms can vary. Internships allow students to practice dealing with these situations. Therefore, a level game about communicating with convenience store customers in this study was developed to simulate a variety of real-life cases, so that every student could experience and comprehend life in the workplace.

# 3.2 Significance of measurement estimation for commercial goods management

Measurement estimation (hereinafter referred to as estimation) refers to the use of estimation to find a benchmark without using measurement tools or the use of mental ability when processing measurements. This estimation ability includes various knowledge and abilities, such as measurement knowledge, the unitizing concept of quantity, and reasoning skills (Joram, Subrahmanyam, & Gelman, 1998; Van de Walle, Karp, & Bay-Williams, 2013). Estimation is a cognitive activity that involves perception, memory, mental imagery, inferencing, and reasoning. Joram et al. (1998) argued that the above elements are inextricably related to the development of logical reasoning ability in reasonable estimation, and such ability is also the mathematical ability of psychological estimation and reasoning that needs to be cultivated through curriculum and teaching (Ministry of Education, 2010; Huang, 2016). The advancement in the applications of technology information allows people to take advantage of the radio frequency identification system (RFID) by applying it to supply chain systems when managing purchases and sales of goods. However, convenience store products are diversified. Not every product can be marked with a tag to transfer messages, such as the purchase time, shipment time, and quantity, to the reader, and then store them in the store's database. Therefore, it is sometimes necessary for shop staff to make visual estimations when they are in a hurry to purchase goods. The cognitive psychological operation required for estimation includes the four elements of perception, conversions, mental imagery, and counting. (1) Perception refers to visual observation, which is the basis for estimation (O'Daffer, 1979). Estimators need to make direct and rough comparisons using visual observation, spatial perception, and operational actions (Van den Heuvel-Panhuizen & Buys, 2008). (2) Conversions are used to communicate with purchase and shipping personnel and describe the estimated results (Montague & Van Garderen, 2003). (3) Mental imagery refers to recalling previous measurement experiences, finding benchmarks, and employing the psychological unit to make psychological inferences on the measured object (Joram et al., 1998; Joram, 2003). These psychological operations include knowing the unit of a certain measurement value, storing it in the memory system as a psychological unit, building it into an image, and then using this



E-ISSN: 2469-6501 VOL: 8, ISSUE: 11 November/2022 DOI: <u>http://dx.doi.org/10.33642/ijbass.v8n11p1</u>

 $\odot$ 

https://creativecommons.org/licenses/by/4.0/

measured. These operations are all conducted (Kosslyn, Reiser, Farah, & Fliegel, 1983), inferred (Forrester, Latham, & Shire, 1990), and reasoned (Towers & Hunter, 2010) by the imagery representational system. (4) Counting refers to calculating the partitioned quantity by point counting, addition, or multiplication, and describing the estimated result of the object to be measured (Joram, 2003; Joram et al., 1998). In short, estimation is an activity that integrates multiple cognitive operations, such as perception, memory, mental imagery, inferencing, and reasoning. Joram et al. (1998) mentioned that the above factors are closely related to the development of logical reasoning ability of reasonable estimation.

addition, estimation is inextricably tied to In measurement knowledge. The following measurement concepts indispensable competencies for processing various are estimations: (1) command the nature and measurement procedure of the object to be measured by knowing its nature (such as the distance, area, and volume) and how to measure it (Van de Walle et al., 2013); and (2) the unitizing concept, in which the measurement unit is the element of various estimations (O'Daffer, 1979). Therefore, unitizing is a kind of psychological calculation that contains important thinking in dealing with quantitative situations. When individuals are familiar with measurement units, the psychological units they created can be employed as a benchmark for estimation and act as an important basis for developing a sense of quantity (Bright, 1976). Therefore, in this study, the mathematical problems related to estimation were included in the game system.

Volume is the amount of space occupied by an object. The volume of a solid object is a numerical value used to describe the space the object occupies.

Usually, the number of convenience store staff in Taiwan is either one or two. However, these stores have many items for sale. If customers come in while the staff is counting goods, they must complete counting within a very short time. As a result, the volume of goods delivered by the delivery person might need to be visually judged for receiving and counting goods. Because most convenience stores in Taiwan are small, the staff are close to the objects. When the staff has an estimation reference for the volume of a single piece of the item, there will be almost no misjudgment on the to-be-measured objects due to parallax. Due to the reliability of the quantity recorded on tally slips at the logistics end, visual estimation is one feasible way for a single person to handle customers and deliveries in the store at the same time. In this study, relevant estimation questions were included in the game.

# 3.3 Number sense experience of earning points and customer loyalty

The activity of collecting points is a loyalty program (Lee, 2020). Kotler (2003) defined the activity of collecting points as a kind of incentive system designed according to the frequency and intensity of customers' purchases; that is, a promotional activity designed based on the number of times et.al., 2010; Lin & Ho, 2015), and the industrial circle consumers have purchased a product in a certain period.

Enterprises cultivate loyal customers by giving consumers extra points, gifts for exchange, or rewards for repurchases. The activity of collecting points has provoked a nationwide boom, and gathering and collecting points have become a necessary marketing strategy for every shop to attract customers. Point cards have a strong appeal. The completion of those cards by sticking the collected points thereon one by one has become the driving force for customers to return and consume repeatedly, and they foster customer loyalty to the brand.

Greeno (1991) defined number sense as flexible thinking about the quantity, prediction, and identification skills used when making calculations. The National Council of Teachers of Mathematics (2000) pointed out that number sense is an intuitive concept of "number". Individuals can obtain a good concept and calculation ability of numbers and quantity through daily experiences. Number sense allows people to be aware of numbers in the calculation process and understand how their changes affect the results during operation (Yang, Reys, & Reys, 2009). Number sense can explain a person's general understanding of numbers, calculations, and situations generated by numbers and calculations. People with number sense ability can carry out real-life math flexibly and elastically and develop the ability for managing store goods, as well as strategies for consumers to deal with the number and calculation problems encountered during the business process.

However, the deadline for claiming rewards after accumulating points is often neglected by consumers, which leads to complaints and leaves a negative impression. Therefore, this study opined that letting students interact with numbers and quantity through natural situations in a virtual store could be a successful way to apply workplace mathematics and experience real number sense.

# 3.4 Scarce sources for technical and vocational education

Students in technical and vocational education are often seen as having an inferior social and economic background, compared with students in general education. Their characteristics and learning methods can also differ from students in general education. Because of this disadvantage, more equipment should be invested in the running of technical and vocational education. Meanwhile, Taiwan's schools still emphasize the educational level of the teaching staff in technical and vocational education (Hsu & Chung, 2022).

In recent years, the issue of the abilities of graduates from technical and vocational education being unable to satisfy the needs of industrial employment has become a concern (Lin & Chen, 2017). The industrial circle has suggested that the curricula are out of touch with the industry, that the teaching content lacks practice, and that the teachers are short of practical work experience. Therefore, the graduates of these institutions cannot immediately begin working, resulting in a gap between the colleges' teaching and the actual needs of the workplace (Yin et.al., 2010; Lin & Ho, 2015), and the industrial circle has suffered from a lack of talent and manpower (Huang, 2019).



E-ISSN: 2469-6501 VOL: 8, ISSUE: 11 November/2022 DOI: <u>http://dx.doi.org/10.33642/ijbass.v8n11p1</u>

 $\odot$ 

https://creativecommons.org/licenses/by/4.0/

With the prevalence of computers in Taiwan, it is feasible to develop electronic resource materials. In the meantime, it is appropriate to provide a level game system for communicating with customers when providing services in convenience stores. This game simulates situations students may encounter before entering the workplace so that they can accumulate knowledge and experience in the operation of a store and the management of customer relationships.

Commercial services require flexible applications of diverse knowledge. Providing a simulated commercial situation and dialogue knowledge about shop managers and customers could allow students to perform drills, strengthen their understanding of the workplace, and cultivate their estimation and number sense abilities.

### 4. Research Method

Before developing the system, the researcher first went to a convenience store to observe its operation and explore the relevant experience of the service personnel. The researcher discussed the issues found with two operators who had owned convenience stores for more than ten years after graduating from



business colleges. The discussions with the store owners probed into relevant learning units, such as management practices, circulation management, English vocabulary, probability in mathematics, permutation and combination in mathematics, as well as specialized terms in the workplace, to ensure the professionalism of the level game. The researcher also had discussions with business teachers, from whom the questions, answers, and solution details in the game were obtained.

RPG Maker, which is production software used to create role-playing games, was applied in this study. The created game contained various scenes, character designs, and dialogue elements, such as the shop owner, the shop manager, customers, and logistics personnel. Players could pass levels using mechanisms corresponding to correct answers and wrong responses. Techniques related to drawing the locations of the store's service desk and commodity shelves, as well as the animation operations, were involved during game production. In the end, this study created a virtual-level game system to develop the student's knowledge about serving customers in convenience stores (Figure 1).

A-pu, you are now a staff member of a
7-11.
Let's test your common knowledge first.
7-11 belongs to the retail industry.
Which of the following is not a 7-11
business characteristic?
E

Focus on promotion
Long opening hours
Diverse goods
Most of the stores have credit card
transaction service

#### Figure 1. The interface of the dialogue between store service personnel

When designing the level game, PowerPoint was utilized for the test questions about business services. The test questions collected online were typed in PowerPoint according to the corresponding scenes. The correct answer for each question was marked by a different color, and the explanation was listed below the answer, making it convenient to copy the questions and answers directly during production to save time.

The study units were mainly divided into the following: *Unit 1: Ability to display new goods* 



Figure 2. The new employee forgets their job on the first day of work

(1) A new employee forgets that they are a member of the store (Figure 2), is monitored by the shop manager, and is required to show more initiative at work (Figure 3).

(2) The female shop manager tests the ability of the new employee to display new goods (Figure 4). When the new employee answers the female manager's questions and selects the correct answer, the system automatically gives a [Yes] and provides explanations (Figure 5). The system automatically scores and accumulates the score of 1G (Figure 6). If the answer is wrong, the system automatically gives a [No] and provides explanations (Figure 7).



Figure 3. The new employee is required to work actively by the director



E-ISSN: 2469-6501 VOL: 8, ISSUE: 11 November/2022 DOI: http://dx.doi.org/10.33642/ijbass.v8n11p1



https://creativecommons.org/licenses/by/4.0/



Figure 4. Testing the new employee's judgment on the display of new goods



Figure 6. If the answer is correct, the system automatically accumulates the gold coin of 1G

### Unit 2: Ability to estimate the quantity of goods

(3) The delivery person calls out to the store staff from the door (Figure 8), and the store manager asks the new employee to receive the goods (Figure 9). The delivery person asks him to confirm whether the quantity is correct (Figure 10)



Figure 8. The delivery person calls the shop staff



Figure 10. Asking if the quantities are correct



Figure 5. The system automatically gives a [Yes] and provides explanations



Figure 7. If the answer is incorrect, the

system immediately gives a [No] and

automatically provides the correct answer

and asks the new employee to count the goods using a math question (Figure 11). The delivery person provides the answer and argues that the volume formula is right (Figure 12). This question group is about the ability to estimate the quantity of goods.



Figure 9. The shop manager asks the new employee to receive and count the goods with the delivery person



Figure 11. Related math questions are given by the delivery person



E-ISSN: 2469-6501 VOL: 8, ISSUE: 11 November/2022 DOI: http://dx.doi.org/10.33642/ijbass.v8n11p1



https://creativecommons.org/licenses/by/4.0/



Figure 12. The delivery person provides the answer and argues that the volume formula is correct

#### Unit 3: Customer service and number sense ability

(4) The new employee talks to a customer at the service desk (Figure 13). A customer asks to exchange accumulated points for gifts (Figure 14). Figure 15 describes the dialogue related to redeeming the accumulated points for a gift, and Figure 16 describes the response to the customer. Figure 17 shows how the store staff determines and confirms the classification difference of collected points, and explains the time frames for different types of points and the expired points to the customer. Figure 18 describes the customer's responses. The new employee replies to the customer about the activity time frame for collecting point stickers in Figure 19. The customer thinks that the store is not clear about the activity time frame for point collection (Figure 20), but the point card lists a description (Figure 21). Figure 22 is about options of a response for the customer's cognition. A compliment is paid by marking correct answers in Figure 23. This question group is for employees to attempt to build the concept of "number and quantity" through actions such as observation, comparison, and analysis. This question group is for

employees to distinguish the availability of "before the date" from the unavailability of "after the date".

In this study, the design of point cards with the numbers and quantity includes point stickers that have expired and those which are currently valid. The purpose of this design is to cultivate students' number sense, and three key points were considered. First, meaningful mathematical activities must be carried out in natural situations to give mathematics the significance of being connected with real-life experiences, rather than the abstract form that is presented in symbols, numbers, and formulas. Second, opportunities for exploration are provided, so that students can build their number concepts through actions such as observation, comparison, and analysis, in the world of numbers and quantity. Finally, the cultivation of number sense allows students to interact with numbers and quantity in natural situations, because extremely abstract thinking or the involvement of too many adults will destroy the students' interaction with mathematics.



Figure 13. The new employee talks to customers at the service desk



Figure 14. Gift exchange dialogue



E-ISSN: 2469-6501 **VOL: 8, ISSUE: 11** November/2022 DOI: http://dx.doi.org/10.33642/ijbass.v8n11p1



https://creativecommons.org/licenses/by/4.0/



Figure 16. Judging and confirming the Figure 17. Response of the customer classification and expiration of points



point collection activity to the customer



Figure 20. The point card has an introduction





Figure 18. Response on the time limit of Figure 19. The customer thinks the activity was not explained clearly



Figure 21. Options of a response to the customer's cognition



Figure 22. A compliment is paid by choosing the correct answers



E-ISSN: 2469-6501 VOL: 8, ISSUE: 11 November/2022 DOI: <u>http://dx.doi.org/10.33642/ijbass.v8n11p1</u>



https://creativecommons.org/licenses/by/4.0/

### Unit 4: Judgment on shift handover

(5) A customer spills his drink (Figure 23), and the store judgment on shift handover. A compliment is properly manager asks the new employee to mop the floor (Figure 24). By the system for correct answers (Figure 27). The new employee replies that their shift is over and they are correct, gold coins are accumulated (Figure 28).



Figure 23. A customer tells the new employee he has spilled his drink



ready to get off work (Figure 25). Figure 26 is about the judgment on shift handover. A compliment is paid automatically by the system for correct answers (Figure 27). If the answer is correct, gold coins are accumulated (Figure 28).



Figure 24. The shop manager asks the new employee to mop the floor



Figure 25. The new employee says it is time Figure 26. Judgment of shift handover to get off work



Figure 27. A compliment is paid automatically by the system for choosing the correct answers

This system could enable 126 users to comprehend what may happen in a convenience store during the process of playing the game and could test the mastery of the knowledge learned by the users in their courses. The life competencies in the workplace were enhanced by simulating the working situation in the store. After the game, the student's responses were summarized as follows:



Figure 28. Gold coins are accumulated

The following are statements that received the most checks for the Agree and Completely agree options, and the percentages presented are a combination of these two options:

(1) 55.6% believed it would be helpful to estimate the volume of objects in the workplace by visual estimation in the future (Figure 29).



(2) 65.1% believed the game helped judge the time customers' issues about the time frame for point sticker frame for the collected points of customers and in handling collections through active responses (Figure 30).



Figure 29. Visual estimation of volume

(3) 63.5% believed it would be helpful to build their number concept and the numbers and quantity concept for time frames (Figure 31).



and quantity"

Figure 30. Judgment of the time limit for

#### accumulated points

(4) 65% believed it would be helpful to distinguish availability from unavailability under the concept of "before the expiration date and after the expiration date", about redeeming points for gifts (Figure 32).



Figure 31. Building the concept of "number Figure 32. Differentiation of availability and unavailability in the concept of "before the expiration date and after the expiration date"

(5) 71.4% believed they should continue to finish their job duties, even if their shift is over (Figure 33).

(6) 66.6% believed that the moving paths of characters at different positions in the game should follow the shortest distances (Figure 34).



Figure 33. Responsibility should be fulfilled even if it is time to get off work

enabled the players (the students playing the game) to practice how to use mathematics in a flexible way, apply mathematics in daily life, and solve problems they will face in the workplace. In the simulation of working in a convenience store, new employees recognize the ability to use mathematics and understand the role of mathematics in the world through different phenomena. Business students must command how to connect business service and management knowledge with mathematics and other fields and apply new knowledge acquired from the curriculum to



Figure 34. The moving paths are the shortest distances

The unit for judging the expiration time of point stickers life, and this is called consistency. Consistency is to add the lifestyle workplace situations of stores to courses of business operation management, circulation management, or mathematics. For example, core competencies include the three dimensions of knowledge, ability, and attitude. Competencies are a large collection, and business operation knowledge, customer coping ability, estimation skills, and employee and supervisor attitudes are all subsets. The combination of three subsets forms the collection of competencies. The users' competencies could be

http://dx.doi.org/10.33642/ijbass.v8n11pi



E-ISSN: 2469-6501 VOL: 8, ISSUE: 11 November/2022 DOI: <u>http://dx.doi.org/10.33642/ijbass.v8n11p1</u>

 $\odot$ 

https://creativecommons.org/licenses/by/4.0/

cultivated by putting these subsets into the proposed game system.

The design of the whole convenience store scene prevented the users from aimlessly looking for checkpoints or routes. When a user answered a question incorrectly, the system would instantly show the correct answer and present an explanation. By doing so, the user could immediately know the weak mastery of knowledge, rather than wait to know all the answers and then absorb the knowledge in the correct answers at the end of the game.

In the age of the internet, textbooks are no longer the only way of education. Electronic textbooks can be designed through computer software. The game system about convenience stores developed by RPG Maker in this study was a simulated electronic version of a convenience store environment. This game could achieve the effect of combining teaching with fun, bring students a fantastic game experience, and allow them to know what may happen in the real workplace. Furthermore, teachers, students, and even parents could test the students' business knowledge through the game system.

#### **5.** Conclusion

This study's store game system was suitable for students in all stages, from enrollment to graduation. It could be harnessed as a self-study tool, an assessment of student learning effects, or a test of the relevant indicators of the students' learning abilities, such as basic business management, store management, circulation service management, and mathematics and life. This system won the favor of the students participating in the testing of the game, and it was also recognized by a number of teachers in departments related to business. This system could therefore contribute to pre-service education to a certain extent.

The game users (students) learned what could happen in the workplace of a store during the process of passing the levels,

and the artificial intelligence (AI) interface in the game automatically provided answers and explanations. In addition, the game allows users to check how flexible they are when applying the knowledge learned in the courses through automatically accumulated gold coin points in the game records. The application of mathematics to the simulation of a real situation in a store was beneficial for the development of the students' number sense ability.

Teachers in vocational high schools mentioned that the store game system could allow students to continuously improve their professional ability, integrate their knowledge with the occupations, meet the talent needs of the stores, and promote commercial stores to train new employees and successfully advance human resource management.

The consistency of talent cultivation refers to the planning of interdisciplinary learning units throughout different learning stages according to the needs of industrial talents, so that talents can continuously strengthen their professional adaptability.

#### 6. Suggestions for Future Studies

International enterprises need foreign language talents. It is suggested that future studies develop versions of this game in other languages.

As the packaging sizes of goods are different, packages with different volumes can be employed as a challenge to test students' visual estimation ability as well as their proficiency in knowledge, quantification of amounts, and reasoning thinking.

#### Acknowledgment

The author appreciates the comments from the review committee. This study was financially supported by the Ministry of Science and Technology under Grant No. MOST 111-2410-H-415-004.

#### References

- Hsu, How-Gao & Chung, Yir-Hueih (2018) The Reform and Innovation of Higher Technical and Vocational Education in Taiwan. National Science Council Project, NSC:105-2410-H-262-008, 1-93.
- Hsu, How-Gao & Chung, Yir-Hueih (2022) Research on Higher Technological and Vocational Education Policy: Taiwan's Major Policies after the Education Reform as an Example, Journal of Taiwan Education Studies, 2022, 3(2), 21-55.

Ministry of Education (2010), Re-construction Scheme of Technology Occupation Education, 1-47.

Ministry of Education (2014), Re-construction Paper of Technology Occupation Education in the Second Phase, 1-59.

National Development Council (2017), Verification Report on "Re-construction Paper of Technology Occupation Education in the Second Phase", 1-16.

Ministry of Education (2018), Education Law of Off-campus Internships for Junior Colleges and Above, 1-16.

- Ministry of Education (2017), Measures for Implementation of Cooperation between Industries and Junior Colleges and Above, 1-3.
- Ministry of Education (2019), Education Law on Technology and Occupation, PP.1-6.
- Ministry of Education (2013), Law on Implementation of Cooperative Education of Senior High Schools and Protection of Rights and Interests of Students under Cooperative Programs, 1-26.

HLW Pan, CW Liu, 2019, An Exploratory Study into the Formation and the Effect of Youth Education and Employment

https://ijbassnet.com/



E-ISSN: 2469-6501 VOL: 8, ISSUE: 11 November/2022 DOI: <u>http://dx.doi.org/10.33642/ijbass.v8n11p1</u>



https://creativecommons.org/licenses/by/4.0/

Saving Accounts Program, Journal of Research in Education Sciences, 15(4), 67-96.

- Wu Shu-Chen, 2020, Development of a Career Competencies Scale for Technological and Vocational Teachers, Journal of Research in Education Sciences, 65(4), 241-273.
- Ministry of Education (2018b), Measures for Implementation of Internship Courses in Senior High Schools, 1-2.
- Joram, E., Subrahmanyam, K., & Gelman, R. (1998). Measurement estimation: Learning to map the route from number to quantity and back. Review of Educational Research, 68(4), 413-449. doi:10.3102/00346543068004413.
- Van de Walle, J. A., Karp, K. S., & Bay-Williams, J. M. (2013). Elementary and middle school mathematics: Teaching developmentally. New York, NY: Allyn & Bacon.
- Hsin-Mei E. Huang (2016) Investigation of the Performance and Use of Strategy Among Elementary School Children in Estimating Measurements of Length, Area, and Volume, Journal of Research in Education Sciences, 61(3), 131-162.
- O'Daffer, P. (1979). A case and techniques for estimation: Estimation experiences in elementary school mathematics--Essential, not extra! Arithmetic Teacher, 26(6), 46-51.
- Van den Heuvel-Panhuizen, M., & Buys, K. (2008). Young children learn measurement and geometry--A learning-teaching trajectory with intermediate attainment targets for the lower grades in primary school. Rotterdam, The Netherlands: Sense.
- Montague, M., & Van Garderen, D. (2003). A cross-sectional study of mathematics achievement, estimation skills, and academic self-perception in students of varying ability. Journal of Learning Disabilities, 36(5), 437-448. doi:10.1177/00222194030360050501.
- Joram, E., Subrahmanyam, K., & Gelman, R. (1998). Measurement estimation: Learning to map the route from number to quantity and back. Review of Educational Research, 68(4), 413-449. doi:10.3102/00346543068004413.
- Joram, E. (2003). Benchmarks as tools for developing measurement sense. In D. H. Clements & G. Bright (Eds.), Learning and teaching measurement: 2003 yearbook (pp.57-67). Reston, VA: National Council of Teachers of Mathematics.
- Kosslyn, S. M., Reiser, B. J., Farah, M. J., & Fliegel, S. L. (1983). Generating visual images: Units and relations. Journal of Experimental Psychology: General, 112(2), 278-303. doi:10.1037/0096-3445.112.2.278.
- Forrester, M. A., Latham, J., & Shire, B. (1990). Exploring estimation in young primary school children. Educational Psychology, 10(4), 283-300. doi:10.1080/0144341900100401.
- Towers, J., & Hunter, K. (2010). An ecological reading of mathematical language in a grade 3 classroom: A case of learning and teaching measurement estimation. The Journal of Mathematical Behavior, 29(1), 25-40. doi: 10.1016/j.jmathb.2009.12.001.
- Bright, G. W. (1979). Estimating physical measurement. School Science and Mathematics, 79(7), 581-586. doi: 10.1111/j.1949-8594. 1979.tb13900.x.
- Lin, C. Y. & Chen, Y. C. (2017) Narrowing the gap between learning and using is a shared responsibility of industries, government, and universities, Taiwan Educational Review Monthly, 6(8), 45-48.
- Greeno, J. G. (1991). Number sense as situated knowing in a conceptual domain. Journal for Research in Mathematics Education, 22, 170-218.
- National Council of Teachers of Mathematics. (2000). The principles and standards for school Mathematics. Reston, VA: NCTM.
- Yang, D. C., Reys, R. E., & Reys, B. J. (2009). Number sense strategies used by pre-service teachers in Taiwan. International Journal of Science and Mathematics Education, 7(2), 383-403.
- Yin, J. C., Shen, M. C., Huang, W. T., Ma, H. R. (2010), Investigation and Research Report on Project of Improving Technology Occupation Education and Enhancing Employment, The Control Yuan, 1-123.
- Lin, Y. H. & Ho, S. Y. (2015), Hidden Danger of Academic Technology Occupation Education Weakening Employment of Students, Taiwan Educational Review Monthly, 4(11), 33-41.
- Huang, K. H. (2019) A Report on Education Crisis of Taiwan, Taipei City: Professor Huang Kun-huei Education Foundation, 1-59.
- Lee, Chi-cheng (2020) The Study on Key Success Factors of Convenience Store Point Delivery Promotion, *Journal* of Cheng Shiu University, 33, 1-20.
- Kotler, P. (2003) Marketing Management. 11th Edition, State of New Jersey: Prentice-Hall.