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Source: *Educational Technology Research and Development*, Vol. 62, No. 2, Special Issue: Transforming the Classrooms: Innovative Digital Game-Based Learning Designs and Applications (April 2014), pp. 209-226

Published by: Springer

Stable URL: <http://www.jstor.org/stable/24546583>

Accessed: 02-07-2018 15:54 UTC

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Using digital board games for genuine communication in EFL classrooms

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Published online: 24 January 2014

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Abstract EFL learners in Taiwan have a low-level communication ability because many learners are still not provided opportunities to use language for genuine communication in classrooms and receive insufficient language input due to the environment. This study examines the use of digital board game language learning set in a task-collaborative platform, digital learning playground, designed for classroom learning. This study investigates whether communicative skills and intrinsic motivation could be improved by seeing relevant context and receiving adequate practice through gaming. Ninety-six high school Taiwanese students ($n = 96$), who were randomly assigned to an ordinary instruction group, a board game language-learning group, or a digital board game language-learning group, engaged in a 50-min English class. Analysis of covariance was used for comparing learning performance through a speaking test between the three groups. A modified intrinsic motivation inventory was conducted to assess learners' perceptions of learning experience and an interview was held for details. The quantitative data presents a higher learning performance for the instruction set at digital learning playground. The qualitative data confirms computerized simulation adapted from board game entails context-relevant immersion, encouraging communication and efficient game instruction management for EFL language learning.

Keywords EFL · Board games · Digital learning playground · Simulations in language teaching

Introduction

The media through which people receive information varies nowadays. It consists of videos, animations, art, textual forms, graphics, the Internet, and even nature. In this

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multimedia-dominated generation, the exposure to information, which is the network, influences people substantially. Some knowledge shown on the Internet sounds very intriguing and motivates readers to indulge in the informative world. However, knowledge passed on to students in ordinary learning environments, schools, could be dull and unsuccessful when it is not relevant and reflective to learners. Besides, schools are sometimes unlikely to accommodate students with dynamic learning materials due to several reasons, such as resources and policy. An increasing number of education communities have found that the knowledge provided in schools is difficult to apply in real life. Herrington (1997) expressed the view that school learning has few connections to real-life learning in terms of cognition, symbol, and abstract concept presentation; and the growing concern about what students can do with what they learn at school and not merely whether they have mastered specific curricular content (Hirsch 2010–2011; Miller and Gildea 1987).

Since the impact of technology and globalization has accelerated English into a powerful language and tool to communicate from field to field, many learners have found that their traditional English learning at school didn't prepare them for real world use of the language. In addition, there are English learning materials and programs, which are usually animated and even communicative, on the web at learners' disposal. This phenomenon shows that informal learning has been more acquirable and flexible within context relevance compared to formal learning. One of the questions under debate these days is whether informal learning is superior to formal learning in an electronic generation. But it is indisputable that schools have no longer trapped knowledge in school castles. Nevertheless, schools still have a direct and decisive impact on learning. Schools provide an orderly and well-supported environment for learners. Thus, schools should select materials that are real-life connected, intriguing, and culturally related to students.

The aim of this research is to develop an optimal English learning environment for EFL learners that not only reinforces the function of classroom learning, such as guidance, face to face interaction and low frustration, but also incorporates the learning materials that are real-life connected and hands-on oriented into the classroom instructional design.

Literature review

Issue of insufficient language input and low motivation for EFL learners

Modern society has been increasingly attaching importance to the ability to apply knowledge whether learned inside or outside of schools to meet real life challenges. Skehan (1998) then claimed that knowledge must be applicable and related to the real world. Resnick (1987) also states that real-life context is rarely forgotten because learners are working directly with the objects and situations that were applied. According to the National Qualification Framework in South Africa (2000), *applied competence* is the ability to put into practice in the relevant context. Therefore, learning input should be context-embedded and learning outcome should align with the ability to reproduce knowledge in potential situations (Carraher et al. 1985; Cummins 1992; Duffy and Jonassen 1992). This shows that EFL learners have been learning English under an inevitably disadvantageous circumstance due to less natural language input and the lack of need in daily life. Since they are not seeing language in daily life, the trend of language assessment including weekly practice, tests, exams, and coursework, has been falling into the stream of behavioristic mechanism, focused on accumulative amount of vocabulary and form. This

method has been implicitly encouraging irrelevant learning (Brown et al. 1989; Bransford et al. 1989; Moseley 2012). Accordingly, learning under such a discouraging learning climate results in low motivation. Brown (2007) remarked that intrinsic motivation is a big issue since learners may have major difficulties when seeing the relevance of English. Besides this, the learning outcome is considered a deviation from the actual ability to use a language. Notwithstanding language ability, the results of Taiwan PISA (The Programme for International Students Assessment) (2009) short report showed that Taiwanese students fall behind in their ability to use their knowledge and skills to meet real-life issues. The results about students' applied competence pinpointed that the overall learning environment in Taiwan has yet to prepare students with the ability to reproduce knowledge in unfamiliar settings in a digital learning era (PISA 2009). We can see that English can be picked up easily in English-speaking countries or English as a second-language countries since the environments are naturally full of authentic materials. In other words, language is relevant to language learners because they "learned" by living with it. In fact, some education practitioners in Taiwan have been exerting efforts on creating an authentic atmosphere for language learners like putting authentic context in textbook design and establishing English Villages for students to immerse in English-speaking daily-life settings. In order to construct an English context-relevant environment on campus for increasing motivation and learning outcome, Lui and Chu (2010) built a context-aware u-learning game with QR-code technology and a mobile device. Even so, experience with applying language is still lacking for most Taiwanese EFL learners. The dominant pedagogical attempt in Taiwanese compulsory education still fell short in creating students' experience for using the language. As a result, overall Taiwanese learners' communicative skills, competence of using English outside of the classroom have still been falling behind.

Difficulties and suggested guidelines of applying simulation computer games in language classrooms

Simulation/gaming is a game genre that highlights the strong connection between a real-life reference game environment and knowledge-in-use playing mechanic. It has been considered a promising means for educational purposes by not only providing a context-rich environment but also creating learning experience through play (Brookes and Moseley 2012; Squire and Durga 2009). The early pedagogical practice, which is the idea of simulation, was mostly developed in non-computer based materials, like role-playing, and was a simulative economic system built for classroom management. Along with rapidly growing technology, computerized simulation has extensive uses in ecology, geography, archeology, business training, language learning and so on. Civilization and SimCity, two renowned commercial computerized games, have been highly discussed when implemented into course curricula (Squire 2008). Civilization is a well-established simulation strategy video game that situates players into historical events by enabling them to manipulate historical scenarios. Squire and Durga (2009) asserted that putting the historical simulation game into coursework had turned knowledge acquisition from a passive static narrative of facts to an active process of gamers' participation along with a facilitation of complex comprehensive competences. Since mastering an elaborate simulative game usually requires considerable time, effort, and commitment to accomplish, this interpersonal and intellectually engaging gameplay is at odds with the traditional instructional framework that is devoted to standardized and norm-reference tests. Squire (2005) implied that a successful simulation game has complexity, flexibility, and replayability as traits. On the other hand, school curricula usually sets learning materials chunk by chunk and level

by level in order to learn step by step. Furthermore, for teachers who introduce computer simulation into practice, lesson planning and classroom management become more difficult (Higgins and Morgenstern 1990). Nevertheless, many researches are still trying to find a better design guideline that integrates digital simulation games into school syllabi because simulation games seem to prepare students for the real world.

The purpose of adapting simulation in language learning is for students to use language in a real context (Cummings and Genzel 1990) and games in classrooms would elicit players' desires to develop new skills, participate in new roles, or better understand the world from a new or professional perspective (Elkind 2007; Gee 2004). At this point, using simulation and games would be a possible solution for insufficient language input and low motivation in EFL countries. Nonetheless, actual implementations fell short in ordinary EFL learning. One of the concerns is the immediate heavy reading load for language learners while comprehending game rules, description and communicating in an unfamiliar language. Krashen (1982, 1985) suggests language teachers should provide sufficient *comprehensible input* for language learners while Bullard (1990) notes that simulations not specifically designed for language teaching usually are heavy on content. Therefore, the challenge for simulation instruction is transferring authentic game resources to comprehensible pieces for learners to play without too much distraction from language barriers. Another challenge is to map simulations and games into curriculum that applies to a teacher's role, classroom management and learners' interaction (Jones 1982; Moseley and Jones 2012; Waston and Sharrock 1990).

Several studies have addressed guidelines for using simulation in a classroom. The content of simulation is modified to provide language practice. In other words, simulation games are output activities (Bullard 1990). The game preparation should be briefly and effectively presented or delivered (Jones 1982). On the other hand, the simulation itself and the evaluation afterwards should be precisely carried out (Bullard 1990; Horner and McGinley 1990; Jones 1982). As for learner's interaction, small-group work is preferable for a less threatening learning climate and most importantly for contributing to the amount of time each student can use the simulation. (Cummings and Genzel 1990; Horner and McGinley 1990). Teachers take an overt act of observing language where it has taken place or was wrongly used (observer), managing time (organizer, controller), hosting evaluation sessions and providing new information to retain motivation (stimulator, adviser) (Jones 1982).

Bridging board game playing in language classrooms

While researching simulation games, we have found that the structure and organization of board games are more feasible for classroom instruction. A common board game usually casts a game world with a game board, illustration cards, a text description as a rulebook, and some simple game properties (Chen et al. 2011). A board game, like other games, is often designed with a social context that serves as a hook or an intact structural game frame. The scale of many board games is generally smaller than simulation online games regarding game time and complexity. This characteristic has more potential to implement board games as a teaching supplement. In addition, board games' face-to-face gaming environment really resembles classroom group activities. Modern board games have been increasingly applied in pedagogical purposes in terms of increasing themes and types of game play (Hinebaugh 2009). *Bolides* is a racing simulation game that players plan the best routes along the squares of the track and push their cars at the speed they want. It applies the concepts of vectors and momentum in game play and can be adapted to teach physics

(Mayer and Harris 2010). Shanklin and Ehlen (2007) indicated that using Monopoly board game in the introductory financial accounting course resulted in students with a better grasp of financial accounting system compared to traditional accounting classes. The game helped the students bridge the financial concepts into reality practice and made the classes run smoothly afterwards. Another school project was that 105 preschool children who attended Head Start program in mid-Atlantic metropolitan area improved their numerical knowledge by playing number board games (Ramani et al. 2012).

Advances in electronics and networks have enabled board games to be applied to different digital platforms, such as websites, tablets, and digital tabletop devices. Digitalized board games, like *Scrabble*, *Carcassonne*, *Apples to Apples*, and *Stone Age*, have connected gamers to an enormous network to play together. In school applications, Hwang et al. (2012) developed an online board game with the learning tasks in the shape of problem-solving and information searching skills. The result showed that the students' learning performance and attitude had been enhanced. Tabletop technology is also considered a good application tool kit to transform educational board games with the advantages of board games and computers. Alofs et al. (2011) designed an interactive storytelling board game on a multi-user tabletop. The finding was that learning around the interactive tabletop facilitated an engaging learning and group play environment. Mayer and Harris (2010) addressed some examples of simulation board games with relation to English and language arts, like *Once Upon a Time* and *Nonfictionary*. These two games may be found too difficult for EFL learners due to high level of communication requirements. Nevertheless, the effectiveness of board game use in language classrooms has been left in doubt because the overall strategy-oriented game play lets students easily neglect language itself. Some simulative contexts with illustrated descriptions are not easy for EFL learners to follow or imagine. The challenge for modified game design is to tailor strategy-dominated gaming mechanics into knowledge-driven games but still keep the entertaining and challenging aspects of board games (Chen et al. 2011). Thus, our research attempted to extend the intriguing context of a board game to a knowledge-utilizing platform that is suitable for classroom learning. With the design, teachers were able to employ a space for students to apply desired knowledge in a fun setting.

Development of the digital board game for language learning

This section demonstrates how we integrated board game playing mechanics into classroom learning instruction in order to enrich learning materials with relevant contexts and to create a knowledge-in-use opportunity.

System structure

Figure 1 shows the design flow of the integration. In classroom settings the media of knowledge presentations are mainly blackboards and textbooks. The knowledge conductor is a teacher. The participants are students. Common classroom activities are lectures, Q&A, and group discussions. As to board games, a board, illustrated cards, and some game pieces are the media; every player can be a game host who is the information delivery person (conductor). The participants consist of two or a group of players. Board game activities mostly include game planning such as roles and resource selection, and performing, such as placing cards and gaining resource.

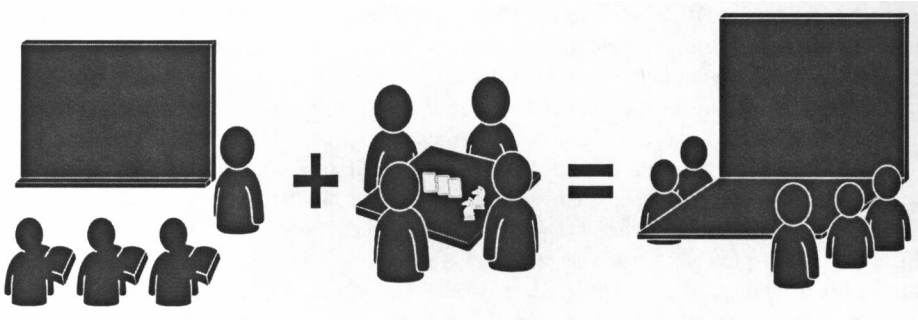


Fig. 1 The design flow for meshing board game playing and classroom instruction

To blend them together, we applied a set of computerized educational equipment called digital learning playground (Fig. 2). Digital learning playground consists of a display that can present contexts or situations and a shared tabletop for task performance and group collaboration. Benefiting from the digital device, the display screen not only serves a known function as a blackboard that students know where to pay attention to but also provides situational plots that are presented in text form or as game actions in board games. This kind of computerized simulation provides language learners concrete demonstrations of authentic language use. We certainly cannot deny the simulative effects that computers can do to create a highly effective medium for learners. Furthermore, being surrounded by animated scenarios and humanlike feedback, like “Oops, sorry, try again,” “Do you want some ice-cream?” increases the extent of language immersion. The shared tabletop’s aim is face-to-face collaboration and a setup better situated for teachers to lead and observe the ongoing activity. It serves as a game board for all the game matters. Team planning and game actions made on the board are associated with triggering events shown on the display. We adopted SMART board, a single-touch interactive whiteboard, for participants to tap and drag digital objects. This touch-enable whiteboard, centrally controlled by a computer, has a major advantage when dealing with some time-consuming procedures or rule-required game actions such as constantly placing, blending, and shuffling cards or game pieces, allowing students to focus on task performance.

As we can see the L-shape computerized equipment (Fig. 2) places learners at the center stage and sets the teacher aside as an adviser and observer. Garrison has claimed an effective educational experience under a computer-mediated community. It should include cognitive presence (i.e., event triggering, exploration, resolution), social presence (i.e., open communication, encouraging collaboration), and teaching presence (i.e., instructional management and facilitation). We argue the L-shape layout from digital learning playground can elicit effective interaction and instruction and fit the criteria Garrison proposed.

Limitation and reality concerns

Some educational communities may be skeptical about costs and the accessibility of the digital device in ordinary school settings. As mentioned earlier, we were searching for an optimal language learning experience for EFL learners. Kreshen (1982) proposed that language acquisition requires meaningful interaction in the target knowledge. The meaningful interaction refers to natural communication in which generally takes place in informal settings (Garcia-Carbonell et al. 2001). Considering an EFL environment does not

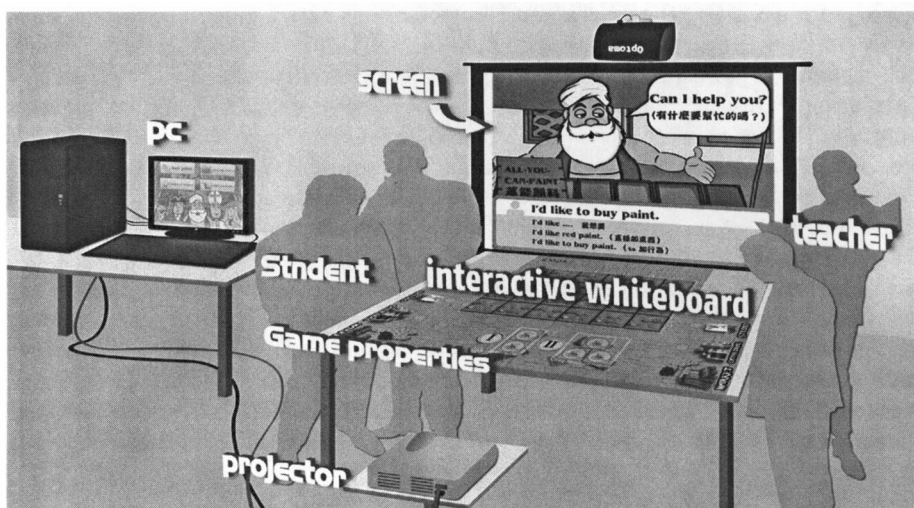


Fig. 2 The setting for digital learning playground

provide much opportunity for EFL learners to have real authentic conversations in the target language, we assume that students would attempt a natural conversation in this simulative setting.

Instructional design

This section introduces how we shaped a board game's content into classroom activities and blended communicative skills practice into simulation game play, including assessment design. The end of the section gives an overlook of the whole instructional design that corresponded to the critical implemented guidelines of authentic learning.

The instruction design guideline is centered on communicative language teaching (CLT) and task-based language teaching (TBLT) in order to equip students to carry language performance through game tasks in classrooms. Authenticity, real-world simulation and meaningful tasks are prominent parts of CLT (Brown 2007). These traits make board games an optimal teaching supplement for language learning because one of the noted features regarding board game mechanics is gaining authentic experiences. Several games used thematic descriptions, graphics, rules, and game pieces to create an immersive gaming environment. For example, *Agricola* simulates a farm life and *Puerto Rico* creates a miniature business in a production industry. In fact, most of the board games with English rulebooks generally support English language learners in terms of helping them build their English literacy skills through the studying rules. However, selecting current board games for EFL's communicative skills facilitation is not as easy as mentioned earlier due to the length and the complexity of common simulative game structures. The selection of simulation board games for communicative skills should be accessible and related to every day topics without too many terms and words to explain. A proper board game to benefit the EFL learners should include several authentic tasks associated with the scenes and actions in the selected board game. *Fresco*, designed by Marco Ruskowski and Marcel Süßelbeck, meets the criteria. *Fresco* immerses players into a painter's life in the Renaissance by dealing with daily errands, earning money, and participating in voluntary

paintings for churches. The language instructor in our research simplified the rules and scenes for the use of language learning. Students work in groups and the tasks provide students with the needs to communicate in different simulative situations. The learning objectives put real-life communication into focus, such as making polite requests, expressing purchasing willingness, and requesting a refund. The activity flow is split into three stages: preparation (lead-in story and game instruction), planning (groups' action-planning), and performing (take-turn performing actions and gaining resources). Besides, Allwright (1976) suggested three elements of instruction of communicative skills: samples of target language; guidance concerning the nature of language (rules, cues and simple knowledge results); and management or directed learning activities. Within digital learning playground's support, the animation scenarios and sentence cues on the screen provide samples of target language. Moreover, an instructor can stand around the shared table to guide and monitor the communicative practice that is surely carried out during the game. Because of the shared screen and table, conversation animations on the screen and game matters on the table, the students' focus and teaching are easy to maintain and deliver.

Communicative skills and assessment

The competences to convey information to another effectively and efficiently are communicative skills. They are best enhanced by giving attention to language use and not just usage, to fluency and not just accuracy, to authentic language and contexts, and to students' eventual need to apply classroom learning to previously unrehearsed contexts in the real world (Brown 2007).

The beginning of this paper illustrated that Taiwanese language learners were lacking English communicative skills. Accordingly, the aim of the instruction was to build fluency and increase awareness of language use in daily-life contexts. Thus, the assessment design narrowed the speaking tasks down to specific targeted social contexts. There are various ways to assess communicative skills, such as presentation tasks, imitative speaking tasks, responsive speaking tasks, and role play. In this research, we constructed a one-on-one computer-based assessment (Fig. 3). It was a type of responsive speaking tasks with a string of picture cues. The test taker was playing the role of a little boy who needed to help his mom with the errands like buying fish at the market, returning a hat and making sure to get the refund. On the way to fish market, the little boy will pass through a toy shop, which is a set task to assess saying no nicely. In these tasks, students should make polite requests; express purchasing willingness, and requesting a refund.

Furthermore, scoring or evaluating speaking tasks can involve pronunciation, fluency, vocabulary, or grammar depending on the purpose of the assessment. For this learning activity, the grader emphasized the speaking ability in the unrehearsed tasked conditions. The scoring criteria were the fluency of clearly expressing and using vocabulary and phrases used for shopping and purchasing. The responses from the test takers were recorded. Teachers or graders have a teacher's grading portal to access and grade the audio files.

Computer-based simulation for language learning at DLP

Beyond the fact, educational simulation is one of the methodologies implementing situated learning, the notion of knowledge and skills that reflect the ways that knowledge will be used in real life situations (Collins and Brown 1988). Therefore, our instructional guidelines followed the design principles of situated learning, anchored instruction,

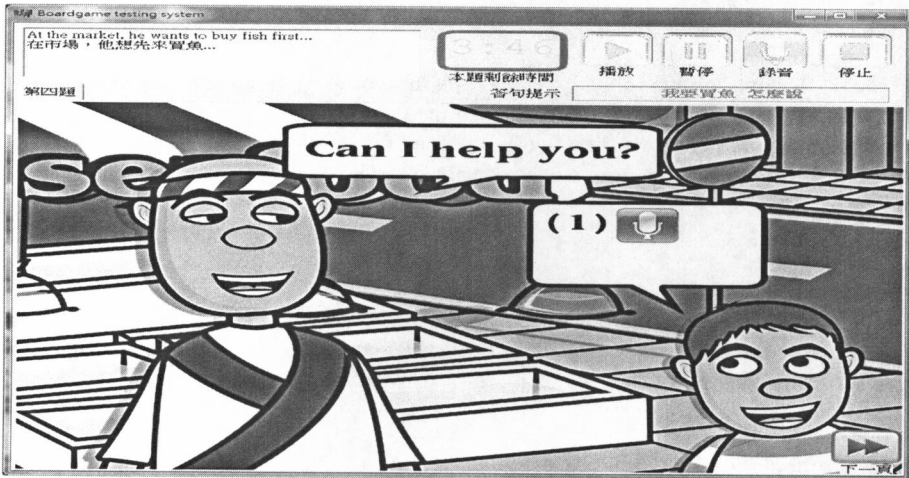


Fig. 3 The test taker interface for one-on-one computer-based assessment

collaborative learning, and authentic assessment and other relevant research (Herrington et al. 2010). The following demonstrates how the instructional design corresponded to the critical implemented guidelines.

Provide authentic context

(a) The setting is originated from a commercial board game, *Fresco*, designed by Marco Ruskowski and Marcel Süßelbeck in 2010, that illustrates a day for a master painter during the Renaissance. (b) The learning objectives are responding to people's request, making polite requests, expressing purchasing willingness, and requesting a refund.

Provide authentic activities

(a) The theme plot is the daily routine of a painter buying paint at the market, making money at their own studio, restoring the frescos at the cathedral, and watching a show at the theater for entertainment. (b) The roles include a buyer, a painter, and a studio owner. (c) The conversations include making purchase, requesting a refund, and dealing with customers.

Provide access to expert performances and the modeling of process

The computer-assisted instruction provides instructional boxes shown on the display containing suggested responses.

Provide multiple roles and perspectives

A purchaser, a shop owner, and a painter are in different scenes.

Support collaborative construction of knowledge

(a) The participants are put into two teams consisting of 3–6 people per team. Two teams, 6–12 students, take turns doing tasks and then the team who plans better has more chance to win more victory points. (b) Teamwork is needed for action planning with peers to make good use of their sources, such as money or paint. (c) The final goal is restoring as many of the tiles as they can.

Promotion of reflection

Trial and error and peer observation let students become aware of improper responses from the other teams and adjust their planning in next round of the game.

Promote articulation

During conversation-based tasks, students are required to respond to the virtual characters.

Provide coaching and scaffolding

- (a) An instructor acting as an adviser provides flexible suggestions and team arrangement.
- (b) An instructor acting as a controller can turn the instructional boxes on and off.

Provide for authentic assessment of learning within the tasks

A one-on-one computer-based speaking test with simulative daily-life scenes.

Interfaces of the game

Digital learning playground

The hardware in digital Learning Playground applied mixed reality technology. A display and a single-touch whiteboard as a tabletop formed a theatre-like setting. Two projectors were set horizontally and vertically. A central control computer was set aside. We used a game development environment, Game Maker V.8.0, to create two game windows. One was for scenarios and plots shown on the display, and the other simulating the selected game board in order to manipulate objects on the interactive board. To connect game components on the board and the associated plot animations two windows were communicating and synchronizing via a TCP-IP (transmit control protocol) socket.

One-on-one computer-based assessment

The environment setting required a computer and a microphone headset. We used Builder C++ as a development platform to build the assessment program, including a test taker interface and a grading interface (Fig. 4). We also applied My SQL database to collect user's personal data and testing data.

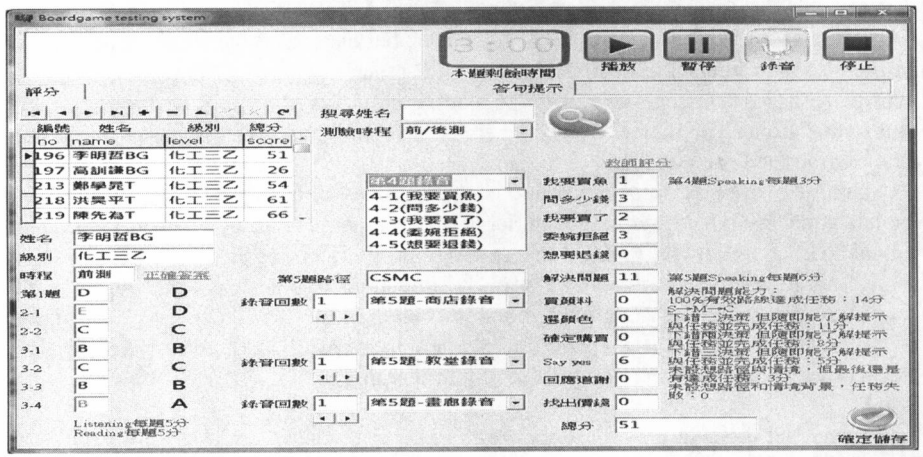


Fig. 4 The grading interface for one-on-one computer-based assessment

Research design

We hypothesized that English instruction adapted from simulative board game content within the Digital Learning Playground setting provides students with a knowledge-in-use playing experience. It can mend the issues of irrelevant context and low motivation in EFL learning. The following research questions were addressed:

- 1. Does learners' learning performance in DLP differ from those in simulation instruction without a digital device?
- 2. Does learners' motivation in language learning under computerized simulative board games differ from those in simulation instructions without a digital device?

As mentioned earlier, we assumed applying authentic learning under a computerized board-game structure makes learners motivate and elicit relevant learning. The following is experiment design, procedure, context, and experimental instruments.

Experiment design

Our research's aim was to enhance motivation and authentic experience in learning English in EFL countries. Our influential designed elements were board games and the digital device, DLP. In fact, the effectiveness of these two combined for learning was not clear-cut. In other words, we were not sure board-game blended language learning was beneficial for EFL learners. Accordingly, the experiment primarily focused on comparing motivation and learning performance between ordinary learning, simulative board-game blended language learning and computerized language learning simulation.

The experiment design used one experimental group, DLP group, and two comparison groups, board game group and ordinary teaching group. The ordinary teaching group was in an ordinary classroom with a projector and a screen. The teacher applied the materials that used in the other groups, such as a themed story, and conversations and taught them the way he usually conducted class with teaching and pair conversation practice. The board game group learned English with the original board game pieces such as coins, color blocks, and action cards. An instructor led the board game activity plus the dialogue cards

(characters and designed conversations) specially made for the group. The teacher in the board game group not only serves as an instructor, but also acted the roles of the vendors and the bishop to interact with students. The DLP group operated our core design- digital board game-based language learning. The teacher only served as an instructor and facilitator in this group. The interactive characters of the board game and the conversation cues were programmed early at DLP.

To minimize the experimental variations, the instructor in each group was the same one who had gone through the learning materials, the game-based learning instructions with the original board game and DLP before this experiment. The learning activity in each group is 50 min. Additionally, since language-learning simulation was designed mostly for small-group activities, digital learning playground fits better with 6–12 students on two sides of the table. Therefore, 32 participants in each group were divided in four teams, eight students as a team, and were assigned a 50-min learning activity.

Participants and procedure

The experiment site was located in a senior high school in Taiwan. The participants were 96 high school seniors who were already studying English for 3 years in their high school life. They have 3-h of English a week. The preparation for the experiment was a pretest to measure participants' prerequisite knowledge of the target knowledge of the experiment. Participants were randomly divided into three groups. The experiment took place during the time that the subjects have finished their college entrance exams. Therefore, loose schedule for senior students at the time enabled us to arrange the activities like workshops in the morning independent-study and class time. Because of this, eight students as a team signed up for the same workshop and then they could proceed with the designed tasks under the same instructor. Two classrooms and a computer lab were arranged for the experiment set up. One classroom kept the original set-up for the ordinary teaching group. The other classroom has DLP along the blackboard side for the DLP group and a meeting table opposite the DLP for the board game group. The computer-based assessment was conducted in the computer lab. Each subject spent at least 100 min for the experiment: a 50-min learning activity and 50-min evaluation including a 20-min immediate posttest (IPT) and a questionnaire. An informal interview was administered to random subjects in each group after the questionnaire analysis.

Instruments

In this study, we examined intrinsic motivation and learning performance. The pretest and IPT were taken using our computer-based assessment program to measure learning performance. The program is a series of scenario-embedded speaking tests like shopping in a market and refunding items. The objective of the assessment was to assess the student's ability to transfer their learning into potential real-life situations. The one-on-one test for this experiment is scored up to 100. The preset criteria were provided. Two graders were assigned to grade the entire test in consideration of reducing bias of grading. In other words, each test taker had two scores and the final score was the average score of the two.

For intrinsic motivation we used intrinsic motivation inventory (*IMI*) (Deci and Ryan 2008). An interview after the experiment was administered after the statistical analysis. The interview was recorded. *IMI* is a multidimensional measurement, based on the "Self-determination theory" (Deci and Ryan 1985), including six subscales and 54 items. It is used in numerous experiments relating to intrinsic motivation and self-regulation. Students

are questioned about their perceptions of interest/enjoyment, perceived competence, effort/importance, value/usefulness, pressure/tension, relatedness and perceived choice of their experience. The authors of *IMI* (Deci and Ryan 2008) recommend that the experimenters choose the subscales that are relevant to their research and the items can be slightly modified, such as an item "...at this activity" can be changed to "...on these tasks" without effecting its reliability and validity. Therefore, we selected four subscales, interest/enjoyment, effort/importance, pressure/tension, value/usefulness pertaining to our research questions and there are 19-item (including five reversed questions) in the modified IMI.

Results

Learning performance

The first research question was to examine whether there were any differences in the learning performances between the three methods of instruction—ordinary teaching group, board game group and DLP group. We conducted a pre-test to evaluate the subjects' prerequisite knowledge and a post-test for learning performance. The learning performance for each participant was defined as the total test score. Analysis of covariance (ANCOVA) was used to examine the differences between the three groups by using the pre-test scores as the covariate and the post-test scores as dependent variables, as shown in Table 1.

The adjusted mean value of the post-test scores was 81.60 for the ordinary teaching group, 77.73 for the board game group, and 83.55 for the DLP group. According to the results ($F = 3.27$, $p = 0.000$), there was a statistical difference in the learning performances between the three groups; that is, the students who learned under digital board game learning showed significantly better learning performance than those who learned with the traditional teaching and the original board game blended teaching. The pair-wise contrast results showed that there were significant differences between the ordinary teaching group and the DLP group ($F = 4.21$, $p = 0.027$); the board game teaching group and the DLP group ($F = 4.21$, $p = 0.008$). Notably, no significant differences between the ordinary teaching group and the board game group shows that the learning performance was not much different under the ordinary instruction or board game supplement.

In conclusion, the instruction set at digital learning playground yielded a higher learning performance compared to the ordinary instruction and the board game blended learning. However, the idea of using the original board game embedded in language learning did not show evidence of a noticeable improved learning performance in the experiment.

Intrinsic motivation

The quantitative data to answer the second research question was analyzed using IMI. It has four subscales: interest/enjoyment, effort, pressure/tension, and value. The responsive scale ranged from not at all true (1) to very true (7). We conducted a one-way analysis of variance (ANOVA) to obtain the statistical results for the questionnaire and further investigated each subscale in different groups. A total of 96 questionnaires were submitted online, with a 100 % response. Descriptive statistics includes means, frequencies, and p value illustrated in Table 2.

The subscale of interest/enjoyment was a self-report measure of intrinsic motivation. The example of this item is "I would describe this activity as very interesting." High score indicates high enjoyment and higher potential to be motivated intrinsically. The mean

Table 1 ANCOVA results of learning performance of the three instruction groups

Groups	<i>N</i>	Mean	SD	Adjusted mean	<i>F</i>	Post hoc tests
Ordinary teaching (a)	32	79.22	1.67	81.60	3.27***	a < c
Board game (b)	32	77.91	1.64	77.73		b < c
DLP (c)	32	85.75	1.66	83.55		c > a, c > b

*** $p < 0.001$

scores of three groups are above average but the extent of the enjoyment among three groups was not significantly different.

The subscale of effort/importance assesses how important learners perceived the learning activity and levels of making an effort to accomplish. The reversing item is “I didn’t try very hard to do well at this activity.” The results demonstrate that three groups of students perceived themselves as putting effort into the tasks or learning activities. However, there wasn’t much different effort commitment among the three groups.

Pressure/tension is a negative predictor of intrinsic motivation and thus, high score implies impeding motivation. We assumed the learning group under gaming structures creates a low-pressure atmosphere. Table 2 shows the mean score of the DLP group has the lowest tension (3.25), but unexpectedly, the board game group was the highest (3.69), slightly higher than learning under ordinary teaching (3.50). The responses compared within the three groups indicate that there is a significant difference ($F = 3.50, p = 0.03$). The multi comparison shown in Table 3 illustrates there is a significant difference between the DLP and the board game group ($F = 3.50, p = 0.01$). The results show students perceived less stressed learning with digital learning playground while language learning with papered board game playing caused higher anxiety.

Value/usefulness is the subscale indicating whether learners perceived the activity they experienced as useful or valuable and became self-regulating. High scores indicate a positive attitude toward the learning activity. The example item illustrates “I would be willing to do this again because it has some value to me.” The mean scores depict the participants perceived high value of language learning with daily life topics embedded. However, the different activities showed not much of a difference in the level of usefulness.

Table 2 Mean comparison of the modified intrinsic motivation subscale scores among three instruction groups

Subscale	OT ^a M (SD)	BG ^b M (SD)	DLP ^c M (SD)	<i>F</i>	<i>p</i>
Interest/enjoyment	4.46 (2.93)	4.49 (2.82)	4.55 (2.85)	0.30	0.74
Effort/importance	3.88 (1.44)	4.07 (2.44)	4.10 (3.82)	1.33	0.27
Pressure/tension	3.50 (2.45)	3.69 (2.72)	3.25 (3.02)	3.50	0.03*
Value/usefulness	5.32 (4.64)	5.53 (3.56)	5.83 (3.53)	2.10	0.13

^a Ordinary teaching^b Board game^c Digital learning playground* $p < 0.05$

Table 3 Multiple comparisons of the pressure/tension subscale of modified intrinsic motivation among three groups

Comparison group	Group	Mean difference	SE	<i>p</i>	95 % Confidence interval
OT ^a	BG ^b	−0.94	0.69	0.18	−2.30 to 0.42
	DLP ^c	0.88	0.69	0.21	−0.49 to 2.24
BG ^b	OT ^a	0.94	0.69	0.18	−0.42 to 2.30
	DLP ^c	1.81	0.69	0.01*	0.45 to 3.17
DLP ^c	OT ^a	−0.88	0.69	0.21	−2.24 to 0.49
	BG ^b	−1.81	0.69	0.01*	−3.17 to −0.45

^a Ordinary teaching

^b Board game

^c Digital learning playground

* *p* < 0.05

Interview

From the questionnaire, we unexpectedly discovered that the board game group had the highest tension during the learning activity. The purpose of the one on one individual interviews was primarily focused on students' level of tension and what caused tension under a simulation game in language learning. The interview was conducted during the school's recess with 15 interviewees, chosen by convenience sampling, five from each experimental group. The students were asked to recall and give a brief review about the experiment activity. Next, the interviewer asked their perception of pressure or tension during the experiment. We consolidated the data and drew some conclusion. All the interviews were recorded. However, the qualitative data collected from the interview was not representative enough to fully explain the statistical analysis. In other words, the collective data from the interview was not treated as answers applying to all the subjects.

First, the students in the ordinary teaching environment had low pressure in general in terms that the teaching atmosphere was similar to their English class. Two out of five students had mentioned there might be more pair-work conversation practice than their usual classes. Pertaining to the adapted original board game plus some supplement (the BG group), the pressure came from interacting with the instructor and unfamiliar instructions regarding to board game rules. One respondent stated that interacting with the teacher while role-playing in the game plot didn't make him feel like he was talking to the story character. Instead, he felt a little nervous when there was direct eye contact. Concerning digital board game language learning, most students described that they didn't feel pressure due to the game's atmosphere with classmates. Besides, four out of five respondents gave positive feedback about the story's virtual characters. Quoted from one respondent, "The way the street vendor talked was funny. I was looking forward to seeing how my classmates interacted with him." Another possible reason for higher anxiety in the BG group was unfamiliar with games in learning. The participants were overwhelmed by understanding game rules, details of victory points, constantly acting out a conversation with the instructor. On the other hand, the learners in DLP group could pay less attention to game details because the computer took care of some game actions such as counting, blending cards, and summing. Besides, the participants were really engaging in learning by numerous sound effect and interactive visual effect. As to the instructor, we think computer-assisted simulation language learning also helps to ease instructors' burden.

Conclusion and future research

According to the results of the experiment, the students who learned language with a digital task-collaborative board game platform, digital learning playground, achieved significantly better communication ability in comparison with those who learned in an ordinary teaching and a non-digital board game adaptive language teaching. Besides, digital learning playground was also helpful to the students in encouraging them speaking by playing and learning with sufficient context-relevant immersions and efficient game instruction management.

The positive findings in this experiment may have been contributed to two factors: classroom group learning and, digitalization and visualization presented through board games. Group learning in classrooms not only easily executes a board game's group-playing mechanic with similar level peers but also has assistance from a teacher. More broadly, DLP's face-to-face game surrounding setting can bring the effect that each player can witness and absorb the language being used constantly; and this result in recurrence of thriving language input for EFL learners. The other factor is that, upgrading board games digitally has brought more joy and comprehension of possible situations to language learners through a vivid presentation. Certainly, automating certain gaming actions set aside more time for language practice. In other words, an activity without eliciting language output in a short period of time can be an issue for teachers to use in classrooms. Accordingly, there are some suggestions with this study that should be acknowledged and would be beneficial for future implementation. The primary concern is how to jam a game mechanic into an existing class mechanic where teachers and students already have a set pace and fixed perception of learning. We strongly suggest that the game blending learning should be intergraded into schools' curricula. With respect to that, teachers will not see it as an extra burden and can treat it as conducting a class. Besides, having assessments such as in-class performance or group performance evaluation assures these games blending into learning being implemented in classrooms. Additionally a small-group activity is preferred. It allows students more time speaking English. In other words, a class with less experience with teamwork needs more scaffolding in respect to collaboration.

As mentioned in the board game sections, more and more board games are getting digitalized to fit into this mobile net generation. Nevertheless, the current digitalized board games related to language art are mostly for vocabulary and spelling enhancement. They are resources for highly motivated personal learning. But with seeing considerable benefits in authenticity and knowledge-utilizing experience for language acquisition, our future research is still on top of developing interactive contexts for e-generation learners to create their authentic experience. The future implementations of this proposed approach has two ongoing developments. One is that the learning environment can be used on existing school equipment, such as projectors, a screen, and a computer due to the common concern of not being able to afford high-end facilities. The other development is that we are searching for new technologies that can increase authentic experience. In recent years, motion technology has opened up the opportunity for creating genuine experiences for users. Related products like Kinect and Wii, have been thoroughly involved in entertainment and even edutainment fields. We have also been working on the based learning environment, digital learning playground, added in some motion-controlled device. Nevertheless, we will continue our researches on incorporated simulation and game language learning in school curricula.

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