

I am interpreting an article from a quantitative study, which is on the topic of 'Facilitating EFL students' English grammar learning performance and behaviors: A contextual gaming approach', an experimental study. It is very enlightening for my future research topic.

■ Question 1: scientific method / theoretical considerations

In this study, Halliday's (1975) seven functions of language development and the gaming approach was used. Namely, instrumental, regulatory, interactional, personal, heuristic, imaginative and representational.

Halliday's seven functions of language development and the gaming approach

Functions of language development	Language (grammar) purposes	Examples in a contextual gaming approach
Instrumental	Learners get things done and can use language to express their needs.	Game provides learning content (e.g. concrete nouns/noun clauses). A: ___ it's good to read to children when they're very young? B: Yes, I do. But ___ playing music was important too.
Regulatory	Language is used to influence the behaviors. Language of rules and instructions are included.	Game provides tasks (e.g. persuading, or requesting words and phrases). Learners fill in the blanks to connect two noun clauses in the same sentence with "A" or "B". The gaming behaviors are tracked by the system.
Interactional	Language is used to contact and form relationships.	Learners receive feedback (correct responses) from the game to promote positive learning outcomes.
Personal	Use language to express feelings, opinions, and individual identity	Learners choose the grammar exercises of interest and practice language via item and learning modules.
Heuristic	Language is seeking and learning. Learners can gain knowledge from the environment.	Game provides introduction of grammar rules and language notes in the guiding module. During the gaming process, learners can seek and learn when needed.
Imaginative	Language is used to create stories and an imaginary new world.	Game provides a storytelling environment for learners to assist their language development. The plot in this game tries to spark learners' creative thinking, encourages imagination, improves vocabulary and grammar interest, and develops language literacy.
Representational	Language is used to communicate information, convey a message	Provide writing practice after the game. Learners write about the topic: Do you think that the advantages of ___ outweigh the disadvantages? Give reasons for the answer and include any relevant examples from your own knowledge or experience. Write at least 250 words.

From the theory this derives three research questions for this study:

- (1) To what extent may the contextual game-based learning approach decrease the students' English context and non-context error rates in comparison with the conventional technology-assisted learning approach?
- (2) To what extent may the contextual game-based learning approach improve the students' English grammar learning achievement in comparison with the conventional technology-assisted learning approach?
- (3) What are the differences in the learning behavior of the high-achieving and low-achieving learners for achieving Halliday's functions of language development?

■ Question 2: methodology

Three hypotheses were set for this study:

(H = hypothesis, IV = Independent variable, DV = Dependent variable)

- H1: Contextual and non-contextual grammatical error rates can be reduced by a game-based approach to learning

IV = Game context-based learning approach

DV1 = Context-related grammatical error rate

DV2 = Non-contextual-related grammatical error rate

- H2: Game-based contextual learning methods improve grammar learning achievement

IV = Game context-based learning approach

DV = Grammar Learning Achievement

- H3: Learning behaviours of high and low achieving learners differ in achieving Hanley's language development function.

IV = High-achieving and low-achieving learners

DV1 = Learning behaviour of high achievers

DV2 = Learning behaviour of low achievers

◆ System architecture

The system modules for this study are based on Halliday (1975) and da Silva's (2014) models and functions of language, which includes a game-based learning module, database, learning profile and game interface.

At the start of the game, the system gives the user a plot summary in advance, with the aim of helping students to familiarise themselves with the game interface and the application scenarios and the roles they need to play. As the storyline unfolds, students will trigger learning tasks and begin to learn, with the difficulty of the learning tasks increasing as the story progresses.

The learning module includes the items, learning tasks, guidance and feedback and modules needed to learn the language functions - instrumental, regulatory, interactive, personal, inspirational, imaginative and representational functions - using the Halliday (1975) functions.

- ✧ The **learning module** consists of items, learning tasks, guidance and feedback, all of which apply Halliday's (1975) theory of language learning functions: instrumental, regulatory, interactional, personal, heuristic, imaginative and representational.

(1) In the item module, students are required to find some items in the learning task that relate to a particular set of storylines in order to move on to the next story scene with this information and need to collect all the items to complete the game.

(2) In the learning task module four types of questions are set, namely listening, multiple choice, filling blank and structure questions, in which students must give the correct answer in order to complete the task.

(3) In the guidance module, when a learning task is triggered, the system will lead the student to a specific location where the student can access the relevant learning material.

(4) In the feedback module, there are two situations: one is that when students have completed the task, the system gives them guidance for further study, depending on their learning level.

The other is that if students do not complete the task, they are directed to a specific location where they can study the material again and find their own answers, which are not given directly by the system.

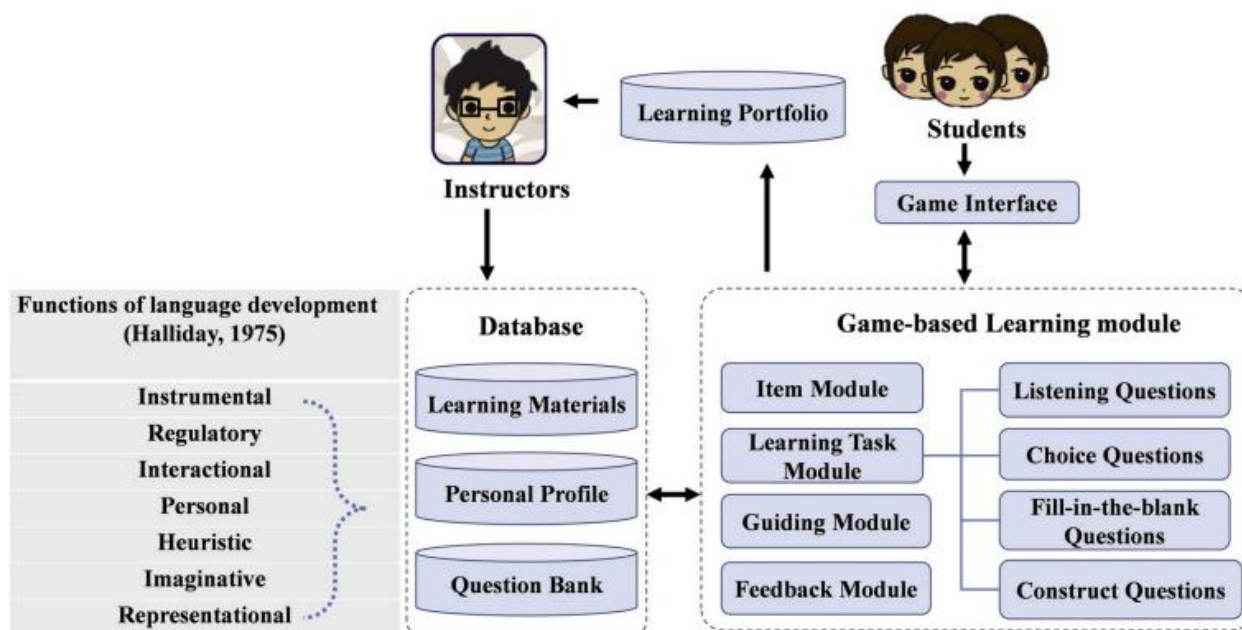


Fig. 1. The system architecture of the contextual game-based learning system.

I have some questions and assumptions about this session.

As the system requires the student to get all the questions right in order to move on to the next session, otherwise it takes the student back to a specific place to continue learning until they find the correct answer. I wondered if the student was stuck in one part of the process and could not move on to the next if they could not find the answer? And if they are repeatedly frustrated, it can be demotivating and greatly reduce their motivation, or even cause them to give up learning.

Therefore, I think it is important to set a tolerance standard in the system to allow students to make appropriate mistakes. For example, as long as the student achieves a certain score, he/she will be allowed to move on to the next level. Specifically, this could be set to allow the student to move on to the next level of learning if he or she achieves at least 80% correct on each individual task and the total score is also no less than 80%. In the learning feedback students' mistakes are summarised and filed in a learning portfolio so that students are aware of their shortcomings and can easily repeat them. The advantage of this is that it ensures that students have a balanced grasp of all the points, so that they don't get a high percentage correct on one item and a low score on another. And when students study the content again, they can skip the points they have already mastered and go directly to the areas where they have made mistakes. This not only saves learning time, but also reduces error rates and improves performance in a more targeted way.

In addition, there is only one female protagonist in the game, which means that both male and female students can only play the role of the female protagonist in the game, which may lead to discomfort and a weaker sense of involvement when the male students are on task, in other words, they cannot put themselves in the role and reduce the experience of the game. I would therefore

suggest that this detail should be addressed by adding the function for learners to choose their own gender at the beginning of the game.

- ✧ The **database module** containing grammar learning materials, profiles and question banks
- ✧ In the **learning profile module** there are information on student learning (learning tasks, items collected), records of learning behaviour (accepting tasks, rejecting tasks, learning materials, transferring to new scenarios, etc.)
- ✧ The **game interface module** contains all the scenes needed for the game

◆ Experimental design

Two classes of 55 first-year students from a university of science and technology in northern Taiwan, China were selected for this experiment, with 31 students in one class being assigned to the experimental group and the control group being served by another class of 24 students. The experimental group used the game-based contextual learning system for learning, while the control group used a traditional technology-assisted learning method like PowerPoint for grammar learning.

1. Experimental procedure.

The study was conducted in four steps:

Basic knowledge Teaching	Both classes were taught the basics of grammar from the assigned textbook by the same teacher with 10 years of teaching experience for a duration of 120 minutes.
Pre-test	Both groups of learners were asked to write a composition of at least 250 words. Duration 60 minutes.
Controlled experiment	The experimental group was taught using a game-based contextual learning system, while the control group was taught grammar using a traditional technology-assisted learning method like PowerPoint, lasting 120 minutes.
Post-test	learners in both groups were asked to write a composition of at least 250 words. The duration was 60 minutes.

The questions for both the pre-test and post-test are taken from the writing section of the IELTS exam and are therefore consistent and reliable.

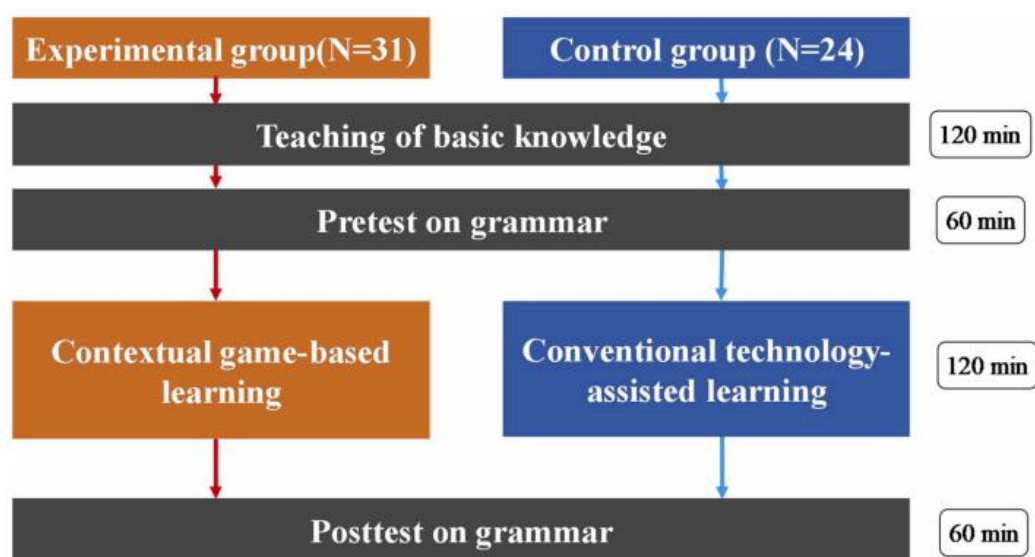


Fig. 6. The experimental procedure.

◆ Data analysis

H1: the construct of context and non-context functions

DV1: Contextual errors: grammatical errors such as misuse of tenses, pronouns, crowns, etc.

Error rate = number of grammatical errors / total number of words

DV2: Non-contextual errors: punctuation, spelling errors

Error rate = number of punctuation + spelling errors / total number of words

H2: Learning achievements

Test scores

H3: High and low achievement group learning behaviours

Students' learning behaviours when performing listening, multiple-choice, fill-in-the-blank and structured questions were coded into four types of 12 items, and the links between the codes were analysed in order.

■ Question 3: results and relevance to theory

H1: Contextual and non-contextual error rate analysis

In the analysis of contextual and non-contextual error rates, independent sample t-tests were used in both the pre-test and the post-test. t-tests have the advantage of being suitable for small sample sizes. Comparing the results of the pre-test and post-test showed that the context-based learning approach did not contribute significantly to the reduction of non-contextual error rates, but had a positive effect on the reduction of contextual error rates.

H2: Analysis of learning achievement

Independent sample t-tests were used to test the academic performance of both groups in both the pre-test and post-test. In the pre-test there was no significant difference between the two groups' scores $t = 1.86$ ($p > .05$), indicating that the two groups were at the same level of grammar. In the post-test, an independent sample t-test was conducted and no significant difference was found at $t = 1.20$ ($p > .05$), suggesting that the contextual game based learning method did not significantly contribute to the students' academic performance.

H3: Analysis of learning behaviour patterns

In the pre-test, the 17 students who scored above the median score of 71 were assigned to the high achievement group and the remaining 14 students were assigned to the low achievement group. Due to the limited data on learning behaviours related to multiple-choice questions, only learning behaviours related to doing listening, blank-filling and structured tests were analysed sequentially in this study. The z-scores for these sequences were above 1.96 (Bakeman & Gottman, 1997) and therefore statistically significant, whether in the 18-behaviour sequence of the listening test, the 12-behaviour sequence of the fill-in-the-blank test or the 13-behaviour sequence of the structured questions test.

The results showed that:

listening test	❖ students in the high-achieving group would attempt to identify the relationship between the task items, the information collected and the learning task, and they were aware of the importance of this relationship, ❖ students in the low-achieving group lacked this awareness.
Blank-filling test	❖ students in the high-achieving group preferred to gather information extensively before starting the task, while students in the low-achieving group preferred to go ahead and understand the questions before gathering information and asking for help. ❖ students in the low-achieving group continued to look at the textbook that students in the high-achieving group did not, suggesting that the low-achieving learners may need more help. ❖ students in both groups refused to learn the task after choosing to seek help or check the task items, perhaps because the information or task items they collected did not help them to complete the learning task.
construction question test	❖ the high achievers were able to complete the test successfully, while the low achievers were not. ❖ the low achievers looked more to the textbook for help with the structure questions. In addition, they tried to find a relationship between the task item and the learning task, showing a strong desire to pass the task.

In summary, this study implemented a contextualised English grammar game and applied it to an English grammar course at a university. Its effects on students' academic performance and learning behaviour were also examined. Learners' learning behaviours were also recorded and analysed separately for the high-achieving and low-achieving groups. The results of the study showed that this method was significantly effective in reducing the rate of context-related grammatical errors, although it did not have a statistically significant effect on improving students' academic

performance, but it also revealed differences in learning behaviour patterns between learners in the high and low achievement groups in order to achieve functional language development. The findings also provide a good answer to the three research questions of this study. and are supportive of the theory on which the thesis is based.

Firstly, Halliday's(1975) functional theory of language development model is realised in the structure of the game context-based system. Secondly, the learning behaviour of students in both the high and low achievement groups takes into account the seven functions of, Halliday's(1975) language development. The game also has the supportive functions of instrumental, regulatory, interactional, personal, heuristic, imaginative and representational to better develop this theory. Finally, the study incorporated these functions into the game and found that students in the high and low achievement groups had different learning preferences.

This study has some **shortcomings** except those described by the authors, such as the small sample size, which does not allow for a wide generalisation of the results; the limited duration and content of this study. I have some additional observations to make.

In the experiments in this study, the students learned only one of the application scenarios and their grammatical error rates were eventually analysed only through essay tests, which does not indicate that the learners were able to apply the virtual learning to the actual scenarios, nor does it give a clear indication of the change in students' performance. Firstly, if the scenario in the game is one that the learner is already familiar with. or the content in the game happens to be something that the learners are good at or have mastered. Even if the learning is not based on a game scenario, students will still get good marks. Therefore, I wonder if the same findings could be obtained if a different scenario was studied and tested in a context that was unfamiliar to the learners.

Secondly, this study did not test subjective affective factors such as motivation, attitudes and self-efficacy, so I suspect that perhaps students in the high-achieving group would have scored well and had lower error rates regardless of the learning style. Some students in the low-achieving group, if subjectively averse, may have refused to take the initiative to learn from the beginning to the end, and therefore their performance would not have improved regardless of the method used. Finally, in terms of the analysis of learning outcomes, as only the writing section was tested, I believe that this does not give a full picture of the impact of the context-based game on students' grammar performance. This is because, according to the authors' classification of grammar into context and non-context types, both types of grammar are present in the writing. In listening, reading and speaking, however, there is almost only context-relevant grammar. Based on the findings of this study that the context-based learning approach increases context-related correctness, I suspect that this learning approach will directly lead to higher score in the integrated test (which includes listening, reading, speaking and composition).

Finally, I wonder whether Candlin's (1987, p. 19) theory of thinking towards task-based language learning could be used in this study. This is because he argues that the introduction of tasks as a basis for classroom action is a convincing and appropriate means of realising certain characteristic principles of communicative language teaching and learning (which of course includes the learning of grammar), as well as a test case for pragmatic and linguistic assumptions. He also advocates the use of 'tasks' as the 'units' of syllabus design, which are similar to the learning tasks in the context

of game-based learning in this study. In this theory, the seven elements of input, roles, settings, actions, monitoring, outcomes and feedback are also considered. This also has some commonalities with Halliday's(1975) seven functions of language development.

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- *Input*. This is the written, visual, or aural information that learners performing a task work on to achieve the goal of the task.
 - *Roles*. These are the roles that learners have in performing a task, such as information-giver and information-receiver.
 - *Settings*. These are the grouping arrangements in and outside of classrooms for which pedagogy prepares learners to communicate.
 - *Actions*. These are the procedures to follow in performing the task or the various steps that learners must take along the road to task completion.
 - *Monitoring*. This is the supervisory process of ensuring that the task performance remains on track.
 - *Outcomes*. These are the oral, written, and/or behavioral outcomes in which the task is intended to result.
 - *Feedback*. This includes evaluation of the whole or parts of a task performance by the teacher or other learners, including corrective feedback on language use as well as other helpful feedback.
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