

Second Language Acquisition Video Game

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Abstract

Traditional methods of learning a second language are often difficult, frustrating, and time-consuming. Typical classroom strategies employ memorization and drills which are often intimidating and frequently ineffective. Communication among people in an ever increasingly connected world with a vast array of languages utilized is vital for so many parts of society. The goal of our research is to create a second language acquisition video game to provide an effective and inviting alternative to learning a second language in a classroom. The approach is to employ a few theories of language teaching integrated with a fun and interesting game. The second language acquisition game exposes the player to an abundance of simple, comprehensible input of their target language in an interesting, motivating, and low stress setting to allow the player to naturally acquire the language. Untitled utilizes total immersion, focusing on the language's culture to offer a fun, motivating, and low pressure way to naturally acquire a language directly through intrinsic meanings of words by two and three dimensional representations in contrast to translations into the learner's native language, creating a unique experience.

Terms and Abbreviations

2D – two dimensional

3D – three dimensional

Affective filter – emotional barrier which inhibits language acquisition

A.I. – artificial intelligence

CBI - Content-Based Instruction

LAD - Language Acquisition Device

Library – the in-game acquired vocabulary

Minigame – a shorter, simpler game within another game

Mod – modification of a computer game

NPC – non-player character

Overworld – the main level from which all levels can be reached

Respawn – return to a previous game state

SLA – second language acquisition

TBLT - Task-Based Language Teaching

Total immersion - completely in the target second language

Untitled – what our game is referred to in the paper until we think of an appropriate name

1. Introduction

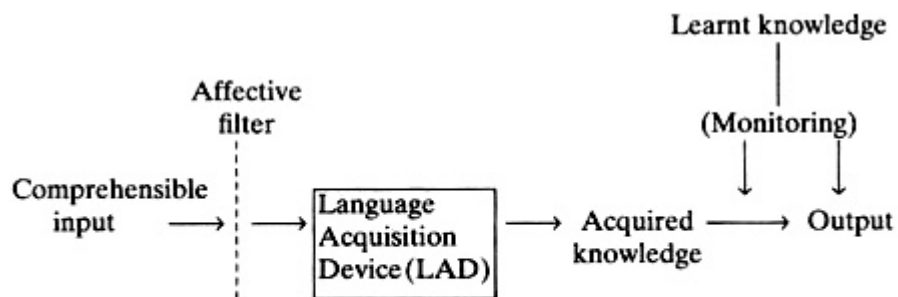
1.1 Second Language Acquisition

In the second language acquisition (SLA) theory, the learner gains an intuitive feel for a language instead of learning sentence structure and grammar rules. Stephen Krashen gives several key points that make the SLA theory a powerful method in teaching a second language [Krashen]. Acquisition must be implicit and subconscious, attitude dependent, present informal situations, use grammatical ‘feel’, and have a stable order of acquisition.

1.2 Input Hypothesis

The Input Hypothesis of the SLA theory states that learner gains an intuitive feel for a second language rather than learning the structure and grammar rules [Krashen’s Comprehension]. The main components of the theory are an abundance of comprehensible input of the target language screened through an affective filter (a barrier formed from the learner’s emotions which block learning) which is then processed by a theoretical portion of the brain known as the Language Acquisition Device (LAD), becoming acquired knowledge [Chomsky]. The affective filter is a barrier which blocks learning which is formed from the learner’s emotions. The learner then uses this knowledge to produce output in the target language which is regulated by traditionally learned grammar knowledge. This theory is modeled in Figure 1 [Krashen’s Comprehension].

Figure 1



The Input Hypothesis Model of L2 learning and production (adapted from Krashen, 1982, pp. 16 and 32; and Gregg, 1984)

1.3 Task-Based Language Teaching

Task-Based Language

Teaching (TBLT) utilizes “tasks” as a method for teaching a foreign language [what is task]. Tasks are actions such as solving a puzzle, conversing with people, reading a map, etc. In order to complete a task, the learner must utilize the target language. Following directions to find a destination is a simple example.

1.4 Content-Based Instruction

Content-Based Instruction (CBI) is a language acquisition approach where the learner acquires language based on the specific subject matter they are focused on [Sticht]. If you are reading a Spanish article about gardening, then you would likely acquire vocabulary about gardening.

1.5 Educational Computer Games

There have been three generations of educational games [Egenfeldt-Nielsen]. The first is focused on the behavior the player produces and how to achieve a target behavior. The second is to focus on how the player learns and adjust based on this. The third is to incorporate culture into the game and allow social interacts to benefit learning from gameplay. The most effective educational games employ all three of these foci.

1.6 Chinese Language Game

The goal of our project is to develop a language learning video game using the SLA theory and other language teaching methods, including the Input Hypothesis, TBLT, and CBI. The TBLT is employed in the game as an example of targeted behavior. CBI is employed as a way to incorporate culture and simulated social interactions using A.I. Untitled uses a dynamic teaching technique as well as an array of multiple level options as a way customize the learning so that the player is self motivated and has a low affective filter to capitalize on the Input Hypothesis of the SLA theory. This project required research in language teaching, effective game design, and the target second language’s culture in order for us to complete our goal.

2. Background

Common drawbacks to this first wave of educational games include: halting gameplay to teach topic; boring gameplay; gameplay and learning material unrelated; and poor or no story [Purushotma]. Recently, a new wave of second language educational games and related research has developed which seeks to overcome many of the drawbacks of the first wave of educational games by retrofitting commercial games with second language material. This educational material is intertwined with gameplay.

2.1 The Sims 2 Modification

A bilingual modification (mod) of **The Sims 2** was studied with the primary goal to teach a foreign language by exchanging or adding English and German text [Purushotma]. A major drawback to this mod is the absence of spoken language to teach proper pronunciation. Even

though the game presents a multitude of words it lacks phrases, sentences, and other applications of this vocabulary. The game also lacks a cultural aspect which is beneficial in learning a second language. Although **The Sims 2** is a rich three dimensional (3D) environment with many useful words it lacks a strong plot which can help the motivation of the player to continue playing. This mod is also not a total immersion experience.

2.2 Tactical Iraqi

Tactical Iraqi was developed for the United States military to teach useful Iraqi Arabic communication skills and cultural non-verbal gestures geared toward soldiers [Alelo]. The focus of this software is too narrow to be as useful as it could be for general learning of the Iraqi Arabic language. Similar products have been developed for soldiers to learn Pashto, French, and Dari. A civilian geared version called **Mission to Iraq** has also been developed at the humble price of \$795 a copy and a similar product called **Mission to France** is also planned. The latter two products increase the usability of the software by broadening its target audience. However the software seems to be more of a 3D instruction software and simulation to learn and practice foreign language learning rather a game to learn a second language in a more fun and potentially more effective environment than a classroom. This game seems geared toward English speakers as it includes some English rather than being a total immersion experience. The software seems to lack gameplay goals and a system to reward progress as well as a lack of a strong story-like plot. The inclusion of these gameplay elements would help create a more fun and interesting game that would encourage the player to continue playing thus learning more of the language.

2.3 Grim Fandango Modification

A mod of **Grim Fandango** was created to teach Spanish by adding more Spanish dialogue to the game and English commentary [Purushotma]. The modification also allows the player to have time to formulate their own response in Spanish, which is not interpreted in anyway by the game itself, before revealing the correct dialogue in Spanish. This game has the benefit of having a rich story and strong gameplay because it is a mod of a successful puzzle adventure game. However the added language learning elements do not contribute to the gameplay nor is there any way for the game to assess the player's progress in learning Spanish. Again the mod is not a total immersion game.

2.4 3DLanguage: Spain

3DLanguage: Spain is a language learning software product with a rich culture-based 3D environment in which the player interacts with the environment by clicking on objects for definitions and talking with artificially intelligent characters that employ a voice recognition system to assess the player and respond accordingly [Coccinella Development]. Like **The Sims 2** and **Tactical Iraqi** this game seems to be more of a simulation in a rich 3D environment more than a plot driven game. From my understanding of this game it seems like the user would have to know at least some Spanish in order to properly use this software and it is more focused on practice of Spanish and expanding existing Spanish knowledge than really teaching the language

from the ground up. There is also an Arabic and English version of this game in development. **3DLanguage: Spain** also seems too targeted toward English speakers, including some English in the game, and is thus not a total immersion experience.

2.5 Chinese Language Game

The goal of the research is to create a fun, interesting game to teach a second language. The game employs SLA theory along with elements of TBLT and CBI. This game aims to overcome drawbacks of previous games and research by having an interesting story and educational elements intuitively blended and intertwined with fun gameplay that never stops to solely teach a concept. The game includes well-defined goals as well as a rich 3D world centered on Chinese culture where the player is fully immersed in a solely Chinese language environment. The educational material presented in this game teaches the Chinese language including characters, pinyin, pronunciation, picture associations, grammar, and vocabulary.

3. Approach/Methodology

Since Untitled's primary goal is to teach Chinese, we knew the game would require several language methodologies intertwined with fun gameplay. We envisioned a game with 3D graphics, an immersive second language environment, first-person style controls, fun and intuitive gameplay, and multiple minigames and tasks to complete. Using the Unity Game Engine, we devised a game where the user would be required to interact with several objects and non-player characters (NPCs), all while boosting vocabulary as well as teaching appropriate pronunciation and Chinese symbols.

3.1 Immersive Environment

Untitled utilized a built-in first-person style controller. With our modifications to this controller, players can 'scan' objects in the game with a simple left-click of the mouse, displaying the object's Chinese character(s), pinyin representation, as well as a pronunciation button that when pressed, lets the player hear correct pronunciation from a native speaker. After scanning an object, this information is stored in a 'library' which can be opened at anytime to refresh the player's memory. Scanning objects also brings up a picture association to tell the player the meaning of the character. SLA requires learners to process the target language directly instead of first processing it in their primary language. This picture not only helps the user process the information directly, but also assists in building a total immersion game.

3.2 Tasks in the Three Dimensional World

The player must also complete tasks involving words in order to progress to new levels in the game. These tasks can be 3D puzzles, dialogue with NPCs in order to solve a problem, or even action packed fighting scenes in which certain acquired words become the player's weapons. Damage inflicted by these enemies does not decrease the player's health, but rather "confuses" the player by corrupting a few of their acquired words. If a word becomes corrupted, not only will their picture association be removed from the library, but the word will no longer be

usable as a weapon. Player's have the option to 'uncorrupt' these words at anytime, by playing a 2D minigame focused on picture associations. Minigames include: memory matching games, discovering words within hints through context clues, and dialogue with NPCs. Instead of a player dying from excessive damage from enemies, they are given second chances by respawning to a previous state.

3.3 Minigames

Throughout the game, players will encounter several minigames centered on vocabulary building. These minigames require the player to complete several 2D based puzzles in order to gain knowledge and receive power-ups. These minigames do not 'lock' the player, but instead give them the choice to leave whenever they desire. Completing minigames not only rewards the player, but also provides clues on how to complete the current level. One example of a minigame presented in this game is a simple matching game where the player is required to match eight Chinese symbols to their corresponding picture representation, gaining a power-up in the process. This presents a fun and familiar way to learn basic Chinese vocabulary with repetition. Another minigame requires the user to complete a basic Chinese sentence. Players select symbols and guess their meaning in order to complete the sentence, which is actually a clue to the current level's puzzle.

3.4 Culture Based Environment and Plot

Learning the culture of the target language's country is greatly beneficial while learning a second language. Untitled takes place in China. The game's rich 3D environment utilizes traditional Chinese architecture as well as modern day architecture. This factor also helps build a unique total immersion game, as well as helping the player feel as if they are actually in China.

3.5 Level Organization

The player progresses through the game by completing tasks presented in each level. The player is presented with an overworld with several routes open initially, while others are locked until the player has completed a certain amount of tasks. If a task is too difficult, players can take an alternative route or return to the overworld, and try another level. The player has the option to replay a completed level to refresh what they have learned. After completing the entire game, the player can replay the game with an increased difficulty, presenting more advanced words, grammar, and puzzles. This dynamic repetition increases the effectiveness of language acquisition while maintaining fun. Giving an array of paths to take prevents the player from being overwhelmed by one level's difficulty all while allowing more advanced players to continue forward, gaining more knowledge.

4. Future Improvements

4.1 Dynamic Player Specific Word Corruption

Untitled also will employ a roulette wheel algorithm for selecting which words become “corrupted” by choosing words based on their probability. This probability is affected by how accurately or inaccurately the player attempts to use words. This strategy enables the game to adapt to how different players learn words rather than assuming all players will learn words at the same rate.

4.2 Artificially Intelligent Non Player Characters and Enemies

The dialogue with NPC will employ A.I. methods to simulate conversations with real people. Also future improvement plans of Untitled include making the enemies better by employing improved A.I. techniques.

4.3 Voice Recognition

Untitled will later include a voice recognition system to assess player’s output and incorporate it into gameplay.

4.4 Expandability and Portability

The nature of the overworld and level progression design allows for new levels to be easily added to the game. Also the Unity Game Engine makes adding functionality very doable. The Unity Game Engine also offers the capability of being massively portable by having the ability to develop games for the PC, Mac, and the web without changing the code at all. Relatively inexpensive, as far as game engines are concerned, expansions and premium editions of Unity allow the creator to deploy games to the iPhone, Android, and Wii with little to no change in development time and cost. The soon to be released Unity 3.0 also has the capability of offering deployment to the Xbox 360 as well.

5. Conclusion

5.1 Ten Key Principles

Because Untitled is still in development and we have neither the time nor the resources at the moment to conduct a full fledged experiment to test the effectiveness of Untitled will compare Untitled against the 10 Key Principles for Designing Video Games for Foreign Language Learning [Purushotma, Thorne]. The principles seek to guide the creation of the best foreign language video games possible by keeping fun levels high, stress levels low, and language learning to the maximum. The 10 key principles are:

#1 At least as much thought needs to go into the design of failure states as for success states.

Untitled employs an overworld with several different available level progressions, many of which are of equal level but composed of different content. The player can freely switch from any available level progression by first returning to the overworld without their progress being lost. Having this overworld design allows the player to continue playing in an equally challenging environment while being presented with different gameplay if the current level is too difficult. This keeps the player playing without getting bored and thus keeps the player learning.

More complex levels contain built-in clues that help the player figure out what to do. These clues include a simple 2D hint drawn on a wall, a person or information object such as a chalkboard with hints or full instructions in Chinese that the player must decipher using their acquired knowledge, context clues, as well as the level environment. Clues may also come in the form of hints or instructions in Chinese from a disembodied voice. Often these clues will be present from when the level loads, but often will be triggered by elapsed time or by number of incorrect tries or a combination of the two.

Also, if a player guesses incorrectly in a 2D minigame, a red 'X' will be shown to indicate that the player selected the wrong word. We are currently trying to improve this system to make player's mistakes both clear, but also done in a humorous fashion to keep the affective filter to a minimum without confusing the player. One idea is to display a funny animation, play a humorous sound effect, or both.

Also, both the word the player incorrectly selects and the word being guessed from context or memory will increase its chances of being "corrupted" during an enemy attack. This is part of the system that dynamically and personally affects how the game challenges players.

#2 Instruction needs to ensure that learners focus predominantly on meaning; secondarily, however, instruction should still include focus on form.

Untitled focuses primarily vocabulary, phrases, and sentences by identifying them directly to what they represent (3D models/2D images, actions, and emotions) rather than translating these representations first into the player's native language before they can understand them. The player must complete tasks and minigames using these representations, thus intrinsic meanings, rather than have to do translations involving the form of the language.

Untitled does not ignore grammar however. In the overworld of the game there is a hallway devoted to form by terminals that trigger minigames. These terminals are unlocked only after the player is introduced to a certain amount of words or occurrences of the respective topic. These minigames are designed to clarify and summarize a specific topic "acquired" throughout gameplay rather than introduce and teach that topic. The minigames are not necessary for completion of the plot, but they do offer incentives for the player to play them such as awards, such as trophies and bonus levels, and prizes, such as bonus points and other game currencies.

The player will also have access to a “decorrupt” minigame anytime they have part of their library corrupted by enemies’ attacks. All words have the possibility of being corrupted, but as a player uses words correctly, those words’ probability of being corrupted is lowered. Similarly, as players use words incorrectly, their probability is increased. Words are corrupted through enemy attacks, disabling the player’s ability to use corrupted acquired words in all aspects of the game such as tasks, minigames, and battles. This gives the player an incentive to uncorrupt their library. Also, if a player has too high percentage corrupted words they will automatically “respawn” to a previous state in the level. This, in effect, acts just as if a player loses too much life in a battle in a traditional video game, without the violent nature.

#3 All elements of the game, particularly communication and input mechanisms, should have a playful spirit to them.

Untitled at the moment does not have a method for the player to input data or responses into the game. This is analogous to the “silent period” of the SLA theory, in which a learner must first intake a vast amount of language before being able to produce any output [Haynes]. This is mostly due to the time and resource constraints of this phase of the research process. A planned improvement is to have a system in place at advanced level progressions where the player will be able to respond to NPCs by selecting from a few pre-constructed sentences and then the NPC will use A.I. in order to react. At more advanced levels the player will be able to respond to the NPC by selecting from a few pre-constructed sentences with parts missing, and then by selecting from a few word choices to complete the sentence. The word choices will initially include one correct choice and a few random incorrect choices. At higher levels there will be more than one correct choice and a few random incorrect choices. As the player progresses to more and more difficult levels, the number of missing parts to the sentences will increase. This will continue until the point where the player will have to respond by creating their own sentences from words in their library.

Ultimately it is planned that the game will include a voice recognition system at very advanced levels where the player can respond and even initiate conversations with NPCs by uttering their own sentences or phrases using just their voice. Of course as the player progresses and gains access to increasingly complex language input methods, the A.I. of the NPCs will have to become increasingly complex and realistic. One idea, once voice recognition is implemented, is to initiate the voice recognition input method once the player first speaks a correct response in a target language, as well as having both the voice recognition and the graphical sentence creation method active at once so the player has multiple options for language input as players will not learn at the same rate.

#4 Metalinguistic descriptions and terminology should be presented through optional supporting material, not as part of the core gameplay.

Much like Rosetta Stone Untitled hides metalinguistic descriptions and terminology from the player as to not confuse the player with information that does not necessarily even help

the player learn the language. Words in the player's acquired vocabulary are color coded to indicate part of speech, but the game never explicitly defines what each color means but rather allows the players to naturally pick up that certain words are related by part of speech. The words are also organized in the library (in-game acquired vocabulary) by part of speech. As mentioned in principle #2, certain linguistic topics and Chinese language specific topics are further explained through optional minigames focused on these topics as a way to highlight and clarify these topics without explicitly naming the specific technical linguistic terms, which reward the player with awards and bonuses rather than core-game-play advancements.

#5 Learning content should be organized around tasks, not presented taxonomically.

Chinese Language Game is educational because the player completes tasks, minigames, dialogue, and proceeds through the plot rather than presenting a problem that involves one common group of words or one common grammatical topic. Again Untitled does allow the player to clarify topics and taxonomical groupings through optional minigames initiated through terminals in a hall found in the over-world. These minigames are only unlocked once the player has acquired enough of those type of words or encountered enough of that grammatical topic and they merely give the player bonuses rather than are required for the plot.

#6 New concepts should be introduced gradually and interspersed with other content before requiring difficult responses from players.

Untitled employs an over-world where there are various "doors", which can be doors, gates, cave entrances, pathways, stairwells, portals, etc., which lead to various level progressions. These level progressions are strings of progressively more difficult yet related levels. The various level progressions also have a sort of ranking based on difficulty themselves so that the player will not be presented with too difficult challenges and material before they have completed a certain amount of lower levels. The player also has the option of leaving a level progression whenever they like and returning to the over-world to pick a different option. Their progress will be saved in whenever they do this so that they can return to that level progression after they feel like they can handle it. The player also has the capability to repeat any level they wish to for either fun or to gain a better grasp of the material presented in that task.

#7 Assessment should intelligently track free production tasks throughout the game, not simply measure controlled production during test events.

Awards, bonuses, game currencies, and plot progress are both awarded to the player by completing tasks, minigames, levels, and level progressions, as well as by attaining certain milestones. These milestones include things such as gaining certain amounts of words in the player's library, or correctly using a given kind of word or grammatical topic a certain number of times. This allows the player to have some sense of accomplishment and feel like they are learning alternative to how well or quickly they proceed through levels. As

stated in previous principles how words are selected to be corrupted also occurs dynamically based on how the player learns, forgets, relearns, forgets again, and relearns again given words.

#8 Consider the Full Range of Gaming Platforms Available.

The Unity game engine allows the creator of a game to easily develop the game for the PC, Mac, and for the web without having to change the code at all. This is a huge advantage because it allows educational games like Untitled to be created for wider audiences in less time and for less cost. Relatively inexpensive, in terms of game engines, expansions and premium versions of Unity allow the creator to expand the game to the iPhone, Android, and Wii. A soon to be released newer version of Unity will also include the option of deploying the game to the Xbox 360 as well. This massive portability creates the possibility of having standalone or add-on mini-versions and expansions to Untitled on smartphones and on the internet as well as versions of the game for the Wii and Xbox 360 with little to no development time and cost.

#9 Games should allow students to spend extra time in activities they enjoy and to minimize time in ones they don't. Ultimately, instructional activities should be designed to teach students how they can autonomously continue playing similar games or performing similar activities taken directly from the target culture.

The over-world and the level progressions of Untitled allow the player to focus on topics and mini-stories they find most interesting and useful. More level progressions can easily be added to the game to even further broaden this possibility.

#10 Where possible, multiplayer games should provide players with meaningful and distinct roles.

Although Untitled is designed as a one player game it can be conceived that the game could be expanded to incorporate a multiplayer aspect to it. One possibility is to have multiple players, all wishing to learn the same language although not necessarily having the same native language, have different unique level progressions with unique content and contexts. The players are later joined together in common level progressions where they must communicate with one another in order to solve the task presented, and the task involves content from different players' level progressions. In this way they must work together and thus learn from one another while solving a shared task.

Another possibility for a multiplayer aspect to a game like Untitled is to have one player with a given native language, say English, seeking to learn Chinese through a game like Untitled paired up with another player with a different native language, say Chinese, seeking to learn

English through a game like Untitled (although with English as the target language). The two players would have the same tasks, vocabulary, and plot, presented to them except the English player would only view things in Chinese, and the Chinese player would only view things in English. They would have to work together to help each other learn their respective target languages while completing tasks and proceeding through the plot of the game.

5.2 Anecdotal Results

5.3 Future Expansion and Experiments

Dr. Jijun Tang and graduate student Jeremiah Shepherd plan to continue work on Untitled and devise a thorough, structured experiment to test its effectiveness against an introductory Chinese language course.

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[Formatting/citing of references?]

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