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Publication Date

2022-09-18

Peer reviewed

Mistoria: A Narrative Tool for Language Learning

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Abstract: Learning a new language is an asset for which the benefits have been well documented. However, our educational institutions struggle to provide the opportunities that enable our students to achieve meaningful levels of fluency and proficiency. *Mistoria* is an initial proposed design solution that leverages the affordances of Second Language Acquisition Theory, Games for Learning, and Learning Analytics to realize a compelling and effective means of learning another language.

Background

The benefits of learning a second language have been well-documented over the last 50 years. Students taking Spanish courses as a second language demonstrate greater academic achievement by scoring significantly higher on standardized tests than students that don't receive foreign language instruction (Armstrong & Rogers, 1997; Lopato, 1963; Rafferty, 1986). Students that identified as bilingual were also found to have developed better reading skills (D'Angiulli et al., 2001; Díaz, 1982; District of Columbia Public Schools, 1971; Garfinkel & Tabor, 1991). Learning a second language can also contribute to improvements in cognitive abilities (Bamford & Mizokawa, 1991; Barik & Swain, 1976; Landry, 1973; Samuels & Griffore, 1979; Stewart, 2005; Weatherford, 1986). Finally, language learners are found to have a more favorable attitude toward the second language and its speakers (Bamford & Mizokawa, 1989; Peal & Lambert, 1962; Riestra & Johnson, 1964).

Despite the benefits, second language learning faces challenges within our educational institutions. Traditional classroom contexts are not conducive to the ways in which students best learn a second language. This notion is expressed by Zhao & Lai (2009) where they demonstrate that the paucity of second language exposure and inaccessibility to use the language in authentic contexts impose significant challenges for those that are trying to learn the language. Platt & Brooks (1994) further criticize classrooms and their failed attempts at building "acquisition rich environments" that ultimately boil down to meaningless communications or simple exchanges of information. These inauthentic and decontextualized language exchanges emulate a content-driven, instructionist approach (Johnson, 2005) as opposed to the situated actions of people in material and social contexts that support language learning (Gee, 2013). Fortunately, there has been a recent shift from direct instruction to socially constructive and collaborative strategies (Ellis, 2003; Thomas, 2012). Likewise, *Mistoria* is an application of theory and narrative that intends to help address the second language learning in ways that educational institutions are deficient.

Theory

There are three prominent areas of study that serve to support a solution for this problem: Second Language Acquisition, Games for Learning, and Learning Analytics. A brief understanding of each of these fields and their relevant implications will guide the design of *Mistoria*.

Second Language Acquisition

There is a marked difference between second language **acquisition** and second language **learning**. The former implies exposure and immersion of language-rich contexts to enable learners to "acquire" the language through their regular interactions. The latter implies a more explicit instruction of the language and its rules. Second Language Acquisition Theory explores the dynamic between this more expressed, direct teaching of a language as opposed to a more organic, immersive, and interactive process (Platt & Brooks, 1994).

Stephen Krashen (1982) initially elaborated on this notion with his Acquisition-Learning Distinction, proposing that there is a fundamental difference between acquiring a language and being explicitly taught the language. Krashen (1982) also proposed the Input Hypothesis, or the idea that a learner can acquire a language when regularly presented with it in a context that is familiar and comprehensible, commonly referred to as *comprehensible input*. While there is much debate opposing Krashen and his viewpoints (Garcia, 2002; Kavanagh, 2006), the effectiveness of *comprehensible input* is further supported by researchers when combined with using the language through interaction (Leaver & Willis, 2004).

Games for Learning

The field of Games for Learning is another promising area of study that can be leveraged as part of a design solution for facilitating language learning. A “game for learning” could be simply described as a game with a specific learning goal (Plass et al., 2020). Many researchers have advanced the field to demonstrate the potential benefits of these types of games (De Freitas, 2018; Hainey et al., 2016), and one advocate went so far as to say that the current problems and conflicts of our world could be solved by games (McGonigal, 2011).

James Paul Gee is one of such researchers that has laid out numerous examples in which games can help accomplish educational objectives including: focusing on well-ordered problems over facts and information, establishing clear goals, providing learners with the tools to solve problems, low cost of failure, and copious amounts of feedback (Gee, 2013). In the way of language learning, a review of empirical studies demonstrates that there are positive results in using video games for second language learning (Kim, 2018; Zhao, 2013) and that they can also support motivation and engagement in language learning (Bytheway, 2015; Ebrahimzadeh & Alavi, 2017). More specifically, games support language learners by providing frequent repetition of vocabulary, exposure to meaningful contexts, and access to resources (Turgut & İrgin, 2009).

Learning Analytics

Learning Analytics is a critical emerging technology that is highly expected to make a significant positive impact on learning and teaching (Johnson et al., 2016). Alyssa Wise (2019) presents a clear definition of Learning Analytics:

[block quote] Learning Analytics is the development and application of data science methods to the distinct characteristics, needs, and concerns of educational contexts and the data streams they generate for the purpose of better understanding and supporting learning processes and outcomes. (p. 119) [block quote]

A major benefit of Learning Analytics is that it can increase the quality and quantity of feedback to students and instructors (Joksimovic et al., 2019). Of special interest are implementations that employ a level of adaptability in the way of *adaptive* learning analytics (Brusilovsky & Peylo, 2003) or *adaptable* learning analytics (Brooks et al., 2014). One popular, but rudimentary approach is Bayesian Knowledge Tracing, a means of student modeling that infers learner knowledge based on their performance and illustrates that performance over time (Corbett & Anderson, 1995).

Design

Mistoria is intended to serve as the initial implementation of a language learning tool that provides the player with language acquisition opportunities, evaluation, and feedback in the context of a traditional role-playing game that will adapt to the performance level of the player by leveraging many of the benefits outlined in the previous theory sections. *Mistoria* sets out to accomplish this

through two core objectives: improve *fluency* and increase *proficiency*. Additionally, salient aspects of the fields of Second Language Acquisition, Games for Learning, and Learning Analytics are synthesized to guide the initial design features of *Mistoria*. These objectives, aspects, and justifications are further discussed below.

Fluency

While it should not be expected that second language learners acquire a level of fluency like that of native speakers, there should be an expectation of a modest amount of fluency in the language. Seely and Romijn (1998) offer a concise and nuanced definition of “fluency” in their book which is adopted as a model for *Mistoria*:

[block quote] The term fluency is used in many ways. In this book the word fluency alone **refers to the ability to express intelligibly in speech (without reading) what one wants or needs to without undue hesitancy or difficulty**. The concept includes the ability to produce one sentence after another in ‘connected discourse.’ It does not refer to grammatical correctness or native-like pronunciation. This is not to say that correctness and good pronunciation are not important or that they should never be worked on, just that they are not part of the concept of fluency as we use the word in this book. (p. 35) [block quote]

A natural starting point to focus for achieving fluency are the words that are most likely to be encountered and used. A researcher found that 85% of English speech is made up of the 1,000 most frequently used words while 95% of written English text consists of the 4,000-5,000 most recurring words (Nation, 1999). This strategy has been employed by classroom foreign language instructors oriented towards *comprehensible input* through tools like the “Sweet Sixteen” or the 16 most commonly used language function verbs (Peto, 2018). These “high frequency” words will serve as the focus of content covered in *Mistoria*.

Proficiency

Proficiency can be seen as a learner’s “mastery” of the language. Seely and Romijn frame “full proficiency” as “indicating that a person...is able to function at about the same level as most native speakers of the language.” (Seely & Romijn, 1998:35) This measurement is facilitated by a rubric, the likes of which has been designed and provided by the American Council on the Teaching of Foreign Languages, allowing proficiency to be measured along the communicative modalities of speaking, writing, listening, and reading (ACTFL, 2012). *Mistoria* will provide short, frequent, and repeated opportunities in context to develop proficiency.

Rich Narrative

Emulating the narrative experience found in typical role-playing video games, *Mistoria* is designed with a rich, cohesive story and world in which the players immerse themselves. By engaging with the players in this environment, *Mistoria* attempts to instill elements of intrinsic motivation through quests, puzzles, and other objectives as they continue to explore and further the narrative. Beyond the compelling narrative elements that role-playing games can provide, this design also intends to strike a balance between the game-like dialogue and that of real-world conversations. This consideration attempts to leverage the ease and familiarity of dialogue trees while also feeling as near to an authentic communicative exchange as possible.

Adaptive Dialogue

To provide the player with an authentic communicative experience, the dialogue design leverages the already successful dialogue systems found in role-playing games and adds an additional layer of

adaptability. Different from standard branching dialogue trees, *Mistoria* selects the appropriate level of dialogue based on the player's previously demonstrated language performance. For example, if the player has responded in ways that make it clear they have not understood the prompts, then the dialogue system will select a less complex version of the dialogue that is more appropriate to their level of proficiency.

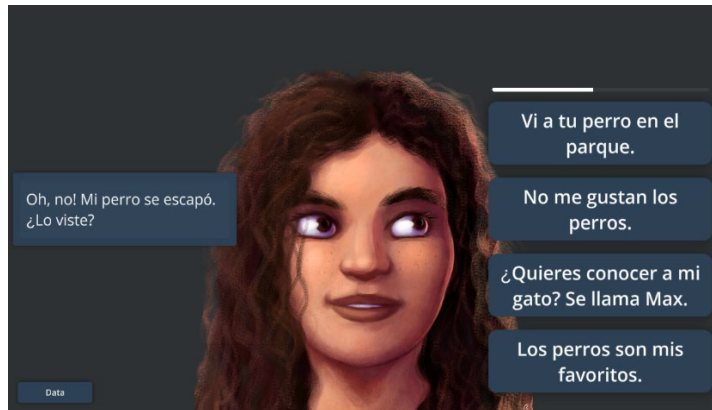
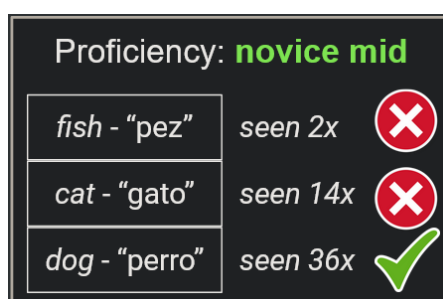


Figure 1
Screenshot of *Mistoria* from inside the Unity game engine

The current design employs a rudimentary implementation of an artificial intelligence algorithm called Bayesian Knowledge Tracing (Corbett & Anderson, 1995) that uses each dialogue interaction to infer whether the player is being successful in their communication exchanges. This system is done at level of the player's demonstrated proficiency level as well as the player's mastery of individual words that appear within the dialogues. As the player demonstrates their mastery of the language, the game responds by acknowledging this accomplishment and providing more challenging content.

Feedback

There are myriad ways in which the design of *Mistoria* provides feedback to the player and their progress. The subtle changes in language that come from the adaptive dialogue system can hint to the player how they are doing. The authentic responses from the game characters when the player responds a certain way can provide insight into the communication. (eg. The character may respond dismissively if the player takes too long to select a dialogue option.) When needed, the player may also seek more feedback by accessing an in-game reference to check their understanding of the terms or to view a register of the different vocabulary that they have encountered or the number of instances. The player can also see a snapshot of how the artificial intelligence algorithm has evaluated their performance.



Proficiency: novice mid		
fish - "pez"	seen 2x	✗
cat - "gato"	seen 14x	✗
dog - "perro"	seen 36x	✓

Figure 2
A mockup of feedback that could be accessed within *Mistoria*

Non-Player Characters

Mistoria makes use of non-player characters, and specifically a cute, expressive, in-game companion named “Mimi”. This companion is always with the player and serves as another vehicle for dialogue and support in the game. Appearing as a small orange orb, Mimi uses floating movements across the game screen while the player navigates the game world. Mimi may gesture or comment on different events by moving near them and highlighting them with an orange glow, support that will decrease and change over time as the player demonstrates higher levels of language proficiency. Outside of this companion, *Mistoria* is populated by other unique and interesting non-player characters that exist to flesh out the world and facilitate the dialogue interactions. Both Mimi and the other characters will engage with the player by means of the adaptive dialogue system described earlier.



Figure 3

Concept art for “Mimi” and other non-player characters (Anonymous, 2016; Clayton, 2017)

Conclusion

Although still early in its design, *Mistoria* is a robust, applied example of leveraging the affordances of multiple fields of study. Through further design cycles, feedback, and development, *Mistoria* will make for a compelling intervention that is grounded in both research and theory. Whether it be used in tandem with traditional classroom instruction or as a primary vehicle for language learning, *Mistoria* is a unique solution for engaging learners in the process of second language acquisition. Once fully realized, *Mistoria* may serve as an exemplar for designing comprehensive and theory-grounded language learning games.

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