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Learning Technology Review

ARIS: A Tool to Promote Language Learning Through AR Gaming

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PRODUCT AT A GLANCE

Product Type	Authoring tool Mobile app to play games created in the platform
Language(s)	English, French, Spanish, Chinese
Level	Beginner, intermediate, advanced
Activities	AR game creation, games, interactivity, speaking, listening, reading, writing
Media Format	ARIS editor website Downloadable app for play
Operating System(s)	Cross platform web-based editor Client (app) iOS 8.0 or later
Hardware Requirements	Web-based iOS device
Supplementary Software	Vuforia.com (only for AR visual overlay)
Documentation	Online manual, tutorial videos, online courses, forums
Price	Free

General Description

ARIS (Augmented Reality Interactive Storytelling) is a free, open-source platform for creating augmented reality (AR) games and interactive stories for players to experience on iOS devices1. The ARIS project began in 2008 as educational design-based research and was designed to "create mobile, locative,

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narrative-centric, interactive experiences" (Gagnon, 2010, p. 1). The platform has now expanded to include 50,000+ users with 15,000+ games created worldwide (ARIS datastudio, 2018). ARIS is available from Field Day, an educational research lab at the Wisconsin Institute for Discovery. Field Day (2018) states "we are for teachers" and this is reflected in the fact that all their content is freely available online, including their games, apps, and courses.

ARIS is designed to be user-friendly to facilitate availability to a wide range of users and requires no programming knowledge. Using GPS, QR codes, or the AR camera view2, the platform allows the creation of a hybrid world of digital media superimposed on real-world locations. In this sense AR is defined as "[a] situation in which a real-world context is dynamically overlaid with coherent location or context sensitive virtual information" (Klopfer & Squire, 2008, p. 205). The majority of the ARIS community employs the platform for a learning context, be it in classrooms, museums, after school clubs, or community action (Field Day, 2018).

The documentation and online help available for ARIS is extensive. The ARIS manual (http://manual.arisgames.org) takes the user step by step through all the features of the platform. Each section provides details and images of the screens containing the relevant feature (what it is, how to create it, and how to use it within your system/game/story). Within the online manual there is a section of tutorial videos, as well as a link to the series of online courses Field Day created to assist authors in becoming familiar with the platform, employing games for learning, using more complex functions such as Javascript, and using AR with camera supported visual overlay (https://fielddaylab.wisc.edu/courses/). Additional support is offered through the active ARIS online community (https://fielddaylab.wisc.edu/forums/). Within the forums authors can search for threads concerning their ARIS question or start a new thread if an existing one cannot be found.

Evaluation

Technological Features

To begin creating with the ARIS platform, the instructor (author) simply creates an account for the editor at https://arisgames.org/editor. The editor is web-based and therefore available for any computer with an internet connection and web browser capability, independent of operating system. The iOS app allows access to all games created within the system. All content is on the ARIS server, meaning both the editor and client read and write to the database in the cloud. A reliable wireless internet connection is required to play the games. For larger games, there is an option in the editor to have all game content download when first opened by players (this is recommended for fewer interruptions of gameplay, especially for asset heavy games). Additionally, if

your play area has weak or sporadic Wi-Fi, gameplay can be improved by turning it off and relying on cellular data instead.

The editor user interface (UI) is straightforward and requires no programming knowledge, employing a drag and drop system with a tabular workflow. Depending on the author's experience with this kind of tool, they may find the UI to be intuitive, but regardless would likely benefit from investing the time to watch the tutorials (this may actually save time in lieu of a trial and error approach).

The basics of the system focus on objects, triggers, and scenes (see Figure 1). *Objects* (the media content you want your players to interact with) are created and visible in the left sidebar. In order for players to access objects a *trigger* must be used. Triggers can be customized in the right UI sidebar and control the game flow by setting criteria that must be met (e.g., GPS location, QR code, game logic) before the player can access the object within a *scene*. Scenes are considered the UI main screen and the means by which to organize your game content.

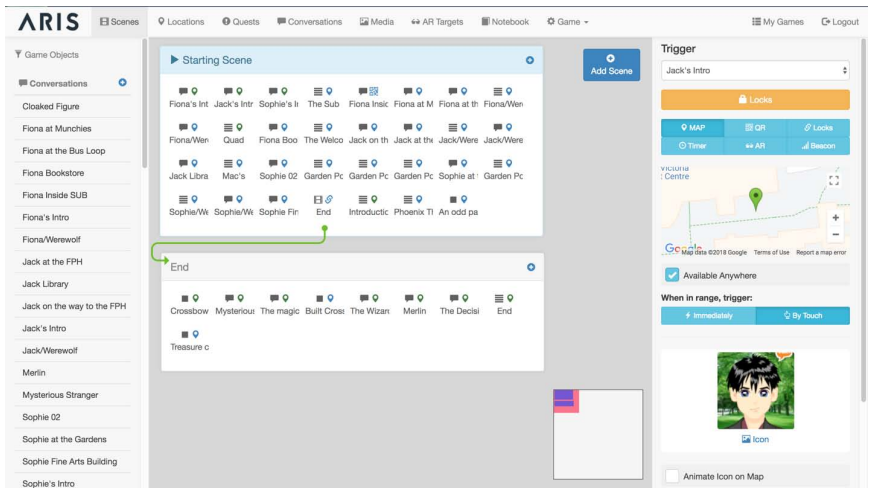

Figure 1. The main UI of ARIS editor: Left sidebar – create and access game objects, center screen – game elements in scenes are visible, right sidebar – trigger customization.

Some examples of objects include plaques, items, and conversations. *Plaques* are a static game object with a text field and the option to upload media (sound, video, image). *Items* share the same fields but with additional functionality such as being picked up, dropped, and destroyed by players. *Conversations* (see Figure 2) are primarily used to create branching dialogue between players and non-player characters (NPCs).

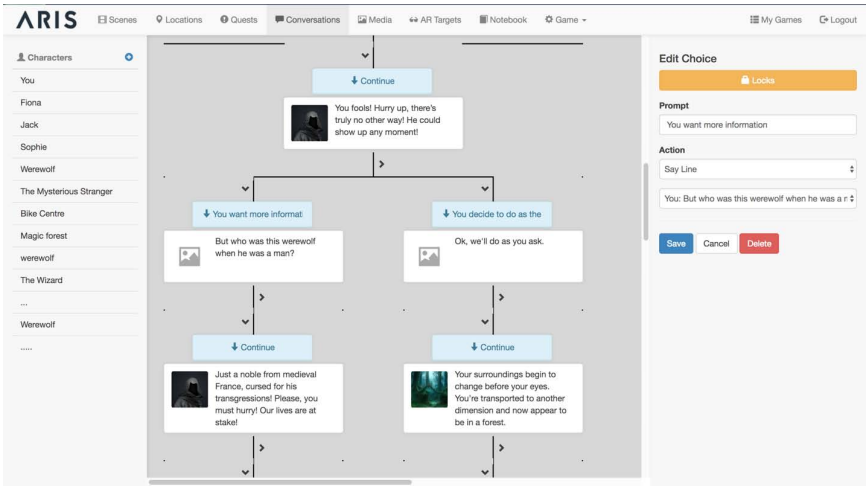

Figure 2. Conversations tab: Left sidebar – create and access characters, center screen – create branching conversations, right sidebar – edit text.

Depending on the desired game flow authors can decide between several trigger types. The default is map which represents the object within Google Maps as a pin varying in range. Authors can use the Locations tab (see Figure 3) to view all map locations they have created and easily modify the settings. Map triggers can be an issue with indoor game locations; QR codes or the camera AR are better suited for indoor play. AR is a recently added trigger (AR camera overlay feature) supported by Vuforia. ARIS holds a license with Vuforia and authors just have to open a free account on Vuforia.com. Vuforia creates the AR markers from uploaded 2D images, which are then imported back into ARIS.

The system for the most part is very reliable; however, as with any technology, issues do arise (e.g., audio crashing in notebook tool during play). The ARIS team encourages the community to notify them via the forums when bugs occur, and these are dealt with as soon as possible. As an author, it is important to remember this platform is a live project, constantly growing and changing to bring new features, fixes, and inevitably bugs.

It is also worth noting that the UI of players' accounts can be customized by changing the international language on the iOS device being used to one of the four supported languages (English, French, Spanish, Chinese). Additionally, the author can create content, include external links, and upload media in any language they choose (this also applies to player created content in games, e.g., notes, video recordings, and audio recordings), giving a wider range of support for second language (L2) play and creation.

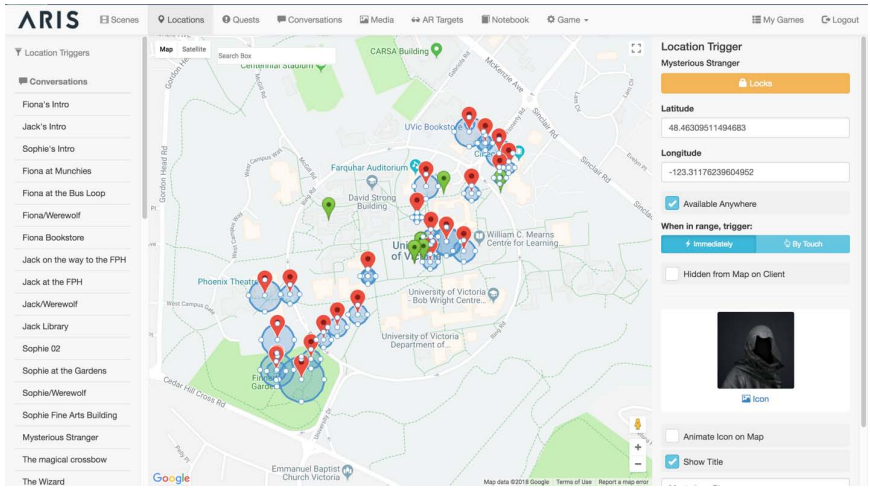

Figure 3. Locations tab: Left sidebar – location triggers, center screen – game objects on map, right sidebar – trigger customization.

Pedagogical or Authoring Features

Given that ARIS is an authoring tool with a wide range of capabilities, it is up to the author to design and implement the desired language learning goals into their game. However, in order to demonstrate certain strengths of the platform for language learning systems, as well as provide examples regarding its capabilities, this review will draw on prior L2 games made with ARIS.

Mentira, a project from the University of New Mexico, is "the first mobile, place-based, augmented reality game explicitly oriented towards the development of language skills in Spanish" (Holden & Sykes, 2011, p. 2). The first part of *Mentira* can be played anywhere and employs branching conversations with NPCs, allowing the students to progress through an interactive story entailing a murder mystery. The second portion of the game (which is place-based) is integrated into real-world locations in the Spanish-speaking community of Los Griegos. *Mentira* requires players to collaborate in order to solve the mystery.

Another example is *Explorez*, a mobile AR campus place-based game for French L2 learning (Perry, 2015a). *Explorez* was developed in correlation with the learning objectives of a first-year French course (developing communication skills and increasing vocabulary). Weekly class themes (e.g., food, travel, cinema) were used to design specific quests, which were then incorporated into locations of interest, such as: where to find available French resource centers, coffee shops, a movie theatre, and a library. *Explorez* uses GPS to create a virtual francophone environment. Students explore their campus and interact

with characters, items, and media as they improve their French language skills. *Explorez* is a virtual narrative treasure hunt where the player is hired as the personal assistant to a French celebrity. Players interact with NPCs at real-world locations, encountering quests with clues or options to further the storyline. These interactions take place in the form of written text, audio recordings, or video recordings, encouraging students to develop language skills both written and oral. *Explorez* consists of three levels with two to four quests at each level which students play in pairs or teams in order to provide learners a choice of which quests to pursue.

Figure 4 shows two NPCs from level 1 of *Explorez*. On the left (4a), the NPC asks the player to get a coffee for the celebrity. Next is a screenshot of the map players use in the game (4b) showing three plaques where a coffee is available. Each location has a virtual coffee (items) the player can pick up, however, only one location has the coffee the celebrity has requested (trigger). The quest is completed when the correct virtual coffee is picked up (and therefore in the players' inventory) and a voice recording ordering the coffee in French at the correct location has been made. The notebook in ARIS allows players to take pictures, write notes, and make audio and video recordings. The NPC on the right (4c) requests a specific French book from the library. Once the students take a photo of the book in the French section of the library, a book item drops onto the map, which the student takes to the NPC to complete his quest. All student created game content is uploaded to the ARIS system, and is accessible to the instructor to evaluate later.

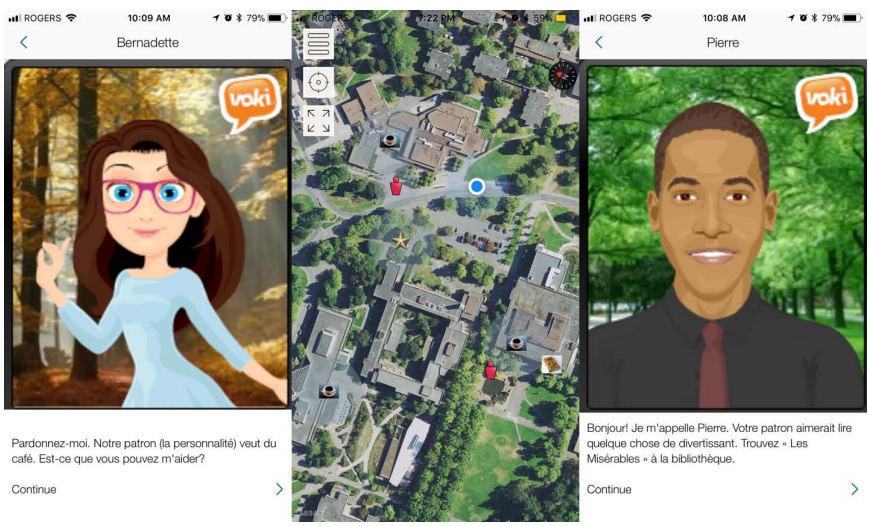

Figure 4. (a) Coffee quest NPC (b) Map view of player UI (c) Book quest NPC.

The above L2 games provide some examples of the capabilities of ARIS, but by no means cover the entire scope of possibilities that the platform has for a L2 learning context3. However, the previous examples illustrate that ARIS holds considerable potential for activities focusing on language skills (reading, listening, writing, and speaking). The platform also allows for a L2 pragmatic focus including authentic tasks and information gathering, as well as a cultural focus.

Teacher/Materials Developer Fit (Approach)

Employing AR for L2 learning holds significant potential in creating relevant learning experiences for students by means of an immersive environment. Another main affordance of these AR environments is their potential to increase learner interaction and engagement. However, similar to other technologies, the educational benefits of AR are not simply the capabilities of the technology, but the ways in which educators design the systems that employ AR and integrate these into the learning environment. The use of AR within a pedagogical context draws on situated learning theory, which posits that learning is socially constructed and naturally embedded within the culture, activity, and context in which it takes place (Dunleavy & Dede, 2014). This can be a challenging task for L2 instructors. Holden and Sykes (2011) address this challenge by incorporating AR into an authentic Spanish-speaking neighbourhood, engaging the students in local contexts. However, as seen with *Explorez*, AR is also a means to create virtual L2 learning environments and provide authentic contexts for students. Additionally, the highly interactive nature and collaborative potential of games made within ARIS support a sociocultural theory lens, focusing on the social nature of language learning and emphasizing learner interactions as a principal learning force (see Vygotsky, 1986; Lantolf & Thorne, 2006).

The time necessary to learn the tool will vary depending on the individual, but overall the learning curve is moderately shallow in regard to ARIS basics. Learning the complexities of the system can be more time consuming with a steeper learning curve. It is beneficial to storyboard your game before beginning development in the platform. As you develop your game it is highly recommended to playtest as you go in order to make certain that the system (especially triggers) is functioning as intended. If the author is familiar with game-based learning and mechanics, and has a solid concept in mind, a minimum viable product (MVP) can be created within a couple of hours (obviously if you are unfamiliar with these concepts, the time will vary). Complex projects, such as *Mentira* and *Explorez*, take a substantial amount of time to create. However, a simple L2 game or narrative can be developed in a very short time. For example, by creating a number of strategically placed plaques, students

could explore their environment and use the ARIS notebook to answer questions or provide information regarding the locations in the target language.

Another option for instructors is to allow their students to use the platform for content creation. Students from elementary school to university have used ARIS to create class projects.[4] As Holden (2015) states "AR game creation can be used as a way to integrate the values, methods, and content of a discipline—i.e. if you learn a lot of content while playing a game, you would stand to learn even more by making a game" (p. 80). Additionally, sharing AR L2 resources is a viable option. The growth and sharing of the repertoire of ARIS L2 games (copies of games are created by simply clicking on "Duplicate" in the editor under game settings) will allow authors to avoid starting from scratch by using a pre-existing game as a jumping-off point. Nelson's (2018) *Paris Occupé*, is a French L2 role-playing game that has several chapters available for instructors to use. *Paris Occupé* is also an example of an ARIS L2 learning experience that is not place-based, and therefore playable anywhere.

Learner Fit (Design)

The versatile nature of ARIS allows authors to create L2 content for any linguistic level. There has been successful implementation of ARIS games for a wide range of learners, from school-aged children to university-level adults. Findings in Bacca, Baldiris, Fabregat, and Graf's (2014) review of AR in education indicated the main advantages of AR are learning gains, motivation, interaction, and collaboration. Research pertaining specifically to ARIS games supports similar findings, with case studies reporting a high degree of student engagement, interaction, and collaboration (Holden & Sykes, 2011; Perry, 2015b). Student feedback indicates that the use of AR in both an authentic L2 environment and a virtually created one provides a contextual and meaningful learning experience (Holden & Sykes, 2011; Perry, 2015a). Students also reported reduced L2 anxiety during ARIS gameplay (Shea 2014; Perry 2015b).

However, AR learning games will not appeal to all learners. Designing systems with a diverse range of game-elements, and the inclusion of both extrinsic and intrinsic learning motivators will appeal to a larger demographic. Appropriate and sufficient in-game feedback is important for both the gameplay and learning context. Additionally, students without gaming experience may not find the player UI or game flow intuitive. Collaborative-based design may help, as Perry's (2015b) case study reported that more advanced students helped lesser-advanced ones with the system (and the target language) when necessary. Well-developed ARIS L2 games allow for student-centered learning, giving students the opportunity to work at their own pace and make meaningful choices.

Summary

ARIS holds immense potential as a user-friendly authoring platform for developing AR experiences that create authentic contexts for L2 learning. L2 games created in ARIS allow learning to take place outside of the classroom, providing an immersive experience that has the potential to be more motivating and relevant for learners. Creating a game as a learning tool in the system can be very time consuming depending on how complex the author wishes it to be. However, simple interactive games can be developed in a brief time. Although entire courses have been successfully gamified in the past, ARIS would better serve as a supplemental resource to the L2 classroom.

Notes

1. A version playable on Android is under construction; details at https://fielddaylab.wisc.edu/forums/viewtopic.php?f=13&t=169).
2. These are not the only trigger types available in the platform. Please see ARIS Trigger Types at http://manual.arisgames.org/editor/trigger-types for a complete list, as well as an explanation of each type.
3. See Place- and Experience-based Database for Language Learning (PEBLL) for ARIS L2 games at https://casls.uoregon.edu/classroom-resources/place-based-programs-database/
4. For examples see Field Day blog "Wisconsin Teachers Know How to Lead Gifted Students: Making Games with Kids That Need Big Challenges!" at https://medium.com/@fielddaylab/just-a-little-bragging-on-wiscoteachers-e7984f409f3a and TS400 Group Project page at https://onlineacademiccommunity.uvic.ca/ts400/home__trashed/assignments__trashed/group-project/

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Reviewer Information

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