

EMERGING TECHNOLOGIES

GAMES IN LANGUAGE LEARNING: OPPORTUNITIES AND CHALLENGES

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There has been a substantial increase in recent years in the interest in using digital games for language learning. This coincides with the explosive growth in multiplayer online gaming and with the proliferation of mobile games for smart phones. It also reflects the growing recognition among educators of the importance of extramural, informal learning and the interest in finding ways to connect learning to students' real lives. Given the important role that gaming currently plays in the everyday lives of adolescents and young adults in developed countries, this spike in interest is not surprising. However, there are a number of practical and pedagogical obstacles in the way of incorporating gaming into instructed language learning. Among those issues are: what kind of games to choose or to create; how to find the opportunities for language learning within gameplay; and how to integrate gameplay and its associated activities into the curriculum. In order to address these issues, we need research-generated data, which is crucial not only for learning how to make gaming more effective in classroom practice, but also in informing future game development. Collecting, analyzing, and sharing data collected from digital games is a major challenge, but some recent technical developments may present new opportunities. This column will not provide answers to the complex set of issues raised in the integration of gaming into language learning, but will identify and discuss some recent developments and point to possible future directions.

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Game Use in Second Language Instruction

It's as meaningless to make general comments about the benefits of gaming in language learning, as to say that technology is beneficial—it's all in the implementation. In the case of games, there is so much variety in approach and scope, that gameplay affordances must be tied closely to the type of game and its use. There's a world of difference between a simple drill and practice vocabulary game, completed in five minutes, and an immersive 3D multiplayer environment, which can continue and develop over long stretches of time. Likewise, there is an immense divide between engaging in an educational game as a class assignment and in devoting hours of free time to multiplayer gameplay, making it an essential component of one's everyday life and personal identity. The fact that digital gaming plays a central role in the lives of a good many young people today provides a rich opportunity to connect with populations who may have limited interest in formal education. If language learning can be tied to popular forms of gaming in a way that does not inhibit its enjoyment, that's a winning situation both for students and educators.

The environments in which digital games are played can vary substantially. Researchers in India developed a set of simple games for rural children learning English, based on traditional village games, and played on loaned-out cell phones (Kumar et al., 2010). In the course of the project, a number of the phones had to be replaced as they were damaged by fluctuating household electrical current; others suffered swollen batteries from the intense summer heat. Some families had no power at all and had to

negotiate with village neighbors to get the phones charged. At the opposite end of the gaming spectrum is a project that virtually immersed users in the world of a French novel, Flaubert's *Madame Bovary* (Cavazza, Lugin, Pizzi & Charles, 2007). It featured a CAVE-based (computer assisted virtual environment) virtual world which included full body tracking and a stereoscopic display (through a special set of shutter glasses). The four-screen display was generated from a central server which was fed graphic information from eight high-powered client computers, two for each screen. The gulf illustrated here between low-end, portable gaming and high-end computing environments specifically designed for gaming is immense. However, with the advent of ever more powerful mobile devices, along with wearable devices such as [Google Glass](#), the potential exists for creating advanced, immersive games that do not require a room full of computers. In fact, some of the most exciting developments in educational gaming today take advantage of both the power of current mobile devices and their portability to create learning opportunities that move out of the classroom and combine virtual and real worlds into a uniquely compelling learning experience. On the other hand, there are some interesting recent projects using a stationary game console, namely the [Microsoft xBox Kinect](#), which allows users to interact with a game through gestures and voice commands. [SpatialEase](#), for example, uses Kinect for a program inspired by the Total Physical Response method. The *Lost Manuscript* is an entire course in beginning Chinese built around a Kinect-based interface (Chang, Sheldon, Si & Hand, 2012).

Given the vast differences in scope and purpose, the most one can say in general about the utility of games is that in optimal environmental contexts, with appropriately selected and trained groups of users, playing a well-designed game, a number of positive and effective language learning experiences are possible. Peterson's (2010) meta-analysis of games and second language learning points to a number of these. Games can offer an immersive environment in which extensive use is made of the target language. To progress in a game, players must often make active use of that language, interacting verbally with game objects or other players. This means that they are using language in real and meaningful ways to accomplish a task. It also means they use the target language in socially appropriate ways; in the game context pragmatic appropriateness is more important than grammatical accuracy. In the process, gamers are exposed to cultural and linguistic knowledge that they are unlikely to have encountered in a textbook or in the classroom. Typically, gamers will encounter a variety of situations calling for different kinds of language use, including requests for help, giving explanations, coordinating planned activities, reporting an action, or asking for alternative solutions (Zheng, Newgarden & Young, 2012). Such language use arises organically from the game and can involve interaction with players from a variety of backgrounds, with game and linguistic knowledge ranging from novice to expert. Players receive a constant stream of feedback in response to game events, player interactions, and speech input. Responses to that feedback engage the player in repeating, revising, and/or reformulating statements. Gameplay typically involves repeated actions in different contexts with increasing levels of difficulty and complexity, providing reinforcement of earlier introduced vocabulary and language structures. These activities are taking place in a safe and inviting environment which provides enjoyment and a sense of accomplishment, as progress through the game is recognized and rewarded (growth in game inventory, moving to a higher level, etc.).

These are by no means automatic or universal benefits—they depend on a large number of variables, including not only the nature and use of the game itself but also the presence or absence of game-related activities, whether they be generated by an instructor or take place at the initiative of the gamer. Gamers typically will not only engage in gameplay, but are likely to consult websites about the game, such as those which give hints or help, provide background information, or offer informal chat about the game. If used as a class assignment, an instructor might create “wrap-around” activities for a game (Sykes, 2013). Those might include oral reports on game experiences, class discussions around gameplay, game journaling, quizzes or exercises based on game vocabulary, or skits based on characters or play action. Sykes & Reinhardt's (2013) recent monograph provides examples of such related in-class activities. Gaming can introduce a welcome element of fun and creativity into the language classroom, not always

sufficiently valued in our emphasis on utilitarian and transactional language use (Pomerantz & Bell, 2007). Language learners should have the same license as native speakers to experiment and play with language, increasingly recognized as an important learning and motivating factor (Kramsch, 2009).

Because of the strong motivational factors involved, game playing can be a powerful agent for learner autonomy, a potential resource for long-term language maintenance, and an entry-point for gaining interest in learning new languages. The degree of engagement players have in gameplay and its related activities is often stronger and more personal than it is for school-related activities. Players create together what has been called an “affinity space” (Gee, 2003) in which the shared interest breaks down interpersonal and inter-cultural barriers, creating an open and tolerant collaborative environment. The give and take among players co-creates a shared space in which language too is co-constructed. This kind of dynamic is optimal for learning, as described in the editorial accompanying ReCALL’s special issue on gaming: “Games are evoking a shift away from models of learning based on information delivery toward theories of human development rooted in experiential problem solving and complex and spatially distributed forms of collaboration” (Cornillie, Thorne & Desmet, 2012, p. 245). In this sense, gaming is part of a learning constellation which includes other informal online activities such as participation in social networks, posting to online forums, or adding commentary to posted media or texts (see Sykes, Oskoz & Thorne, 2008).

Commercial Games: Game-Informed Learning

Language learning through gameplay can happen in a wide variety of ways, from a planned learning activity in an instructional environment to an incidental by-product of a gamer’s interactions with the game and its associated online activities. Equally varied is the providence of games and their intent. As digital gaming has increased in popularity, we’ve witnessed an ever-greater variety in types of games (see this recent [compendium](#)). Most games are commercial products, designed for entertainment, not education. This doesn’t mean they don’t have educational value, including general benefits such as enhancement of digital literacy, increasing socialization, and/or building self-confidence (Arnseth, 2006; Steinkueler, 2007). However, curricular integration of commercial, off-the-shelf (COTS) games may be challenging. Vocabulary use, syntactic structures, and a range of other linguistic characteristics of the language used cannot be determined in advance. In contrast, “serious games” created specifically for educational use can be tailored to specific learning and curricular needs. Unfortunately, such games are inevitably compared to commercial games familiar to students that were created, at great expense, with large teams of graphic experts, online designers, and experienced programmers. Often, educational games lack the sophisticated look and feel of COTS games, while the pedagogical intent is all too evident, sometimes interrupting the all-important “game flow” (Bellotti, Kapralos, Lee, Moreno-Ger, & Berta, 2013). If the game is perceived solely as an assignment, a good part of the benefits are lost—especially the affective factors.

Not all successful COTS games lend themselves to use in language learning. I have not seen mention of projects using a first-person shooter game such as *Doom*, or any of the many versions of racing adventures such as *Grand Theft Auto*. Adventurous language teachers might well find interesting angles to exploit even in these kinds of games. One important consideration in evaluating a COTS game is the use of the target language. While the most widely sold games are available in multiple languages, it is not universally the case. Among the more popular types of COTS games that have been used in language learning are those which construct a virtual world in which the user interacts by taking on a role in the game, usually through the use of an avatar. The simulated world created can be quite similar to the real world or deviate substantially in time (middle ages, far future), space (another planet), and/or might take place in a complete fantasy world. These game environments can be open-ended, with game interest centered around creating and growing a user-designed environment, or they can be or task-based, with the goal being to complete a series of challenges or quests. One of the more popular virtual worlds has been *Second Life*, in existence now for over a decade. It is an open-ended simulation of the real world in which

users can create and customize particular virtual spaces. Over the years *Second Life* has been customized by learners and teachers with areas dedicated to language practice (Cooke-Plagwitz, 2008). However, creating such virtual spaces can be time-consuming and expensive. *Second Life* also is not as open or expansive an environment as is offered by many online gaming platforms. In fact, typical uses of *Second Life* in education involve institutionally controlled spaces, which lack the authenticity and motivating factors of multiplayer online games (Calongne & Hiles, 2007).

Virtual worlds where users have to accomplish specific goals have been seen as particularly amenable to use in language learning. Of particular interest in recent years has been Blizzard's *World of Warcraft* (*WoW*), with a number of studies examining its potential in language learning (Nardi, Ly & Harris, 2007; Rama, Black, Van Es, & Warschauer, 2012; Thorne, 2008; Thorne & Fisher, 2012; Thorne, Fisher & Lu, 2012; Zheng, Neugarden, & Young, 2012). With over 12 million users, *WoW* is the most popular massively multiplayer online game (MMO) on the market today and is available in multiple languages. As is the case in the typical MMO, players advance through the game scenario and gain game playing skills by completing quests, collecting or making items, and buying and selling goods or services. In the process, they must communicate and negotiate with non-playing characters (NPC) as well as with other game players. The studies cited above have shown substantial potential in *WoW* and other MMO games for language socialization and for acquisition of skills related to just-in-time linguistic tools and services. This is particularly the case if player-learners are committed enough to gameplay to participate in auxiliary activities surrounding the game, such as game-related forums or fanfiction (i.e., extending the game story). Much of the data and studies on MMO come from game journals, questionnaires, and player interviews. Of particular usefulness are unsolicited reports on language learning experiences in MMO games, such as those generated by a player inquiry in a forum (Thorne & Fisher, 2012). Although there has been considerable work done on MMO games and language learning, there are few empirical studies showing gains in second language proficiency (Cornillie, Thorne & Desmet, 2012). Particularly helpful would be studies that seek to identify what particular user behaviors, game elements, and game resources seem to be the most promising for language learning. Tracking this information poses both methodological and technical difficulties, as the constellation of online activities and resources surrounding such games as *WoW* is so large that simply keeping track of what's available is problematic. Another difficulty is that COTS games represent inaccessible black boxes with little likelihood of researchers gaining the ability to add tracking tools. There are tools available such as *Elephant*, to save chat logs and record other game information, but they do not provide a full picture of gameplay or of game-related sites used. Some researchers have used video recording of game players or eye-tracking methods (Collentine, 2011), but analysis of such data can be so labor-intensive and time-consuming as to be impractical.

One recent study of *WoW* included the results of a questionnaire to players that indicated that the most popular aspect of playing the game was its social dimension (Thorne & Fischer, 2012). In fact, gamers interact with one another not only during play, but frequently before and after as well. We are starting to see some welcome studies on the implications of such activities for language learning (Thorne & Fischer, 2012; Ryu, 2013). Ryu's study indicates that the majority of language learning gain among the MMO gamers he studied came from "beyond game" activities. In the process, users are exposed to a wide array of forms of online communication. Unfortunately, as pointed out by Thorne, Black, and Sykes (2009), this kind of knowledge is not always valued in traditional language learning: "Digital vernaculars remain largely unaddressed within instructed L2 curricula or, worse, are trivialized or vilified as stigmatized varieties" (p. 815). The dismissive attitude towards such forms of communication is likely related to the negative social views of online gaming, widely seen as an isolating, unproductive, and dangerously addictive activity.

Educational Games: Game-Based Learning

In order to gather more information about game players' activities, one option is to modify or extend a

commercial game, assuming that it is legally and technically possible. Researchers have reported on projects that have done just that, modifying for educational purposes the MMO games *Ragnarok* (Reinders & Wattana, 2011) and *Divine Divinity* (Vandercruysse, Vandewaetere, Cornillie, & Clarebout, 2013). This is not a trivial undertaking, as those studies demonstrate. It might involve adding additional tools to the game, such as voice chat, or creating an entirely new quest scenario. Extensive professional help could be required in the process, such as working with voice recordings and sound effects, creating 3D animations, or lip-syncing. An option that is more likely to be feasible with the limited financial and technical resources available to educational developers is to use a game-authoring template or tool. Developing or adapting a game specifically for educational purposes of course has advantages beyond the ability to capture user data. It allows game developers to focus on particular linguistic goals as well as to control the level of language incorporated into the game. This makes it much easier to incorporate gameplay into a course or curriculum, since the linguistic environment is fixed and predictable. Of course, the challenge remains in making the “serious game” of compelling enough interest that real user engagement takes place. The hope is that players will go beyond seeing gameplay as a course assignment and will gain enough interest to explore and experiment. Self-generated and self-directed discovery can further the kind of intrinsic motivation that commits users to learning more.

A widely discussed example of a game designed for language learning is *Croquelandia*, created specifically with the goal of enhancing learners’ ability to perform requests and apologies in Spanish. The game was created with the Croquet open source development kit, now part of the [Open Cobalt project](#). The game features an immersive environment simulating a study abroad experience. Students are assigned tasks within the game for which they need to interact in Spanish with objects, NCPs, and group members. Advancing towards the game goals requires that the students choose pragmatically correct utterances. While the project did not show significant concrete improvement in use of the targeted speech acts in Spanish, it did show an increase in students’ awareness of meta-linguistic considerations and of the importance of pragmatic appropriateness (Sykes, Oskoz & Thorne, 2008). In fact, the enhanced awareness of linguistic features tied to cultural norms and practices is an outcome that seems more likely to be achievable through gaming than more narrowly focused language goals. This is in keeping with findings resulting from students engaging in other forms of internet-mediated, cross-cultural communication. It’s not likely that either gaming or participation in online chats/forums will result in users increasing knowledge of grammatical rules, but such activities are likely to result in a gain in sociolinguistic skills (choosing the right registers, when to code-switch, etc.), which get scant attention in language classrooms.

Given appropriate resources, language learning games or simulations that target particular linguistic or cultural topics can be successful, particularly if they are used in the context in which learners are highly motivated by external factors. A case in point is the highly touted Tactical Language and Culture Training System from [Alelo](#), designed for use by US military personnel. The system makes rich use of advanced technologies including natural language processing, speech recognition, and artificial intelligence agents, to provide simulated encounters with native speakers in the target culture. A rich set of ancillary and support materials are included. A study of *Tactical Iraqi* showed overall substantial gains in language proficiency (Surface, Dierdorff & Watson, 2007). This is not surprising given the strong motivation on the part of the soldiers whose lives may well depend on being able to communicate effectively with native speakers. One discussion of the program, cited as evidence of its success, is that in one group of U.S. Marines who used the program, there were no casualties during their deployment in Iraq (Johnson, 2010). Most language learning game environments do not involve life or death scenarios so can hardly compete in terms of motivational factors. However, situations such as having to learn a language well enough to secure a job in a new culture or having to cope with being a refugee in a foreign land may well elicit nearly as strong a language learning need.

More typical of language game development in education is the *Tower of Babel* project, which contrasts

sharply with *Tactical Iraqi* in technical sophistication and in target audience. This was a product of an EU-sponsored project to motivate students to learn languages. The game uses an alternative reality environment (ARG) to project a future world in which some languages are threatened with extinction and can only be saved “if students collaborate with each other and with ARG characters to bring people from different parts of Europe together by learning more about each other’s histories, traditions and daily lives of the people” (Connolly, Stansfield & Hailey 2011, pp. 1394-5). Secondary school students from several European countries collaborated to complete quests that involved solving puzzles, taking quizzes, translating texts, and sharing content. Students communicated in the target language they were learning. Given time and financial constraints, the project team elected not to build a game interface from scratch, but instead chose to use the Moodle learning management system and to develop a custom theme, as well as to create other Moodle system extensions. Screenshots of the game (p. 1396) demonstrate a valiant effort to imprint a game skin onto Moodle, with mixed success. While student attitudes towards the game were generally positive, the authors conceded that some aspects of the game did not meet students’ expectations and that future development would likely move to the implementation of mini-games.

One of the features of the *Tower of Babel* game is ease of use, requiring users only to know how to navigate a website. A number of other language learning game projects have used this approach as well. The browser-based game *NineRift*, for example, was used in a project precisely because it was easy to install and to use (Peterson, 2012). Studies have shown that novice gamers in some MMO games do not show the same learning benefits as more experienced gamers (Sundqvist & Sylvén, 2012). Certainly, one of the clear findings of game studies is that user training is mandated if there are likely to be novice users, particularly if the game offers some level of complexity (Peterson, 2011). In fact, depending on the game, more instructor intervention could be necessary, such as, for example, assisting students in getting started in an MMO, or helping to find appropriate groups within the game (Rama, Black, van Es & Warschauer, 2012). Learning to navigate successfully through online games and associated web resources can be an empowering experience for students and contribute to their digital literacy. On the other hand, we should recognize that gaming is not everyone’s cup of tea and should make allowances for individual preferences. That recognition should also include being cognizant of differences in gender preferences in game types (Boyle & Connolly, 2008). In any case, gameplay should not be introduced in a language classroom without an awareness of the practical, pedagogical, and personal issues involved—careful planning is called for.

One additional advantage of self-developed educational tools is the ability for students to go beyond just playing a game to becoming involved in the game creation process. This could happen at a variety of levels, from students’ collaborating on developing story ideas to having students collect or edit game resources such as photos, audio clips, or video passages. Contributing to game creation or design can involve students in deep thinking about approaches to language learning. The kind of peer-level perspective students supply can also be valuable in shaping the game design, so that the end product looks like something that may engage student interest. Additionally, students may well have valuable technical skills to contribute. The creation of *Chrono-Ops* at Portland State University was largely student-driven. The game has an ecological theme: players are tasked with inventing sustainability projects to save the planet. Directions are given in one of three different languages. As part of the game, process users write texts, record audio, and shoot video, all of which can become assets for future players.

Authoring Tools and Mobile Gaming

The hot trend in gaming today is mobile. With the wide use of smart phones, there is a huge installed base for game playing. Mobile devices also have features that are not usually present in personal computers nor in game consoles, such as GPS, accelerometers, compasses, and cameras. A number of easy-to-use game authoring tools developed for mobile games are available, including *GameSalad* and *AdventureMaker*. For more advanced game design, tools such as *Unity mobile* or the *Unreal Development Kit* can be used. A mobile game authoring environment that has been successfully used in developing

games for language learning is [ARIS](#), short for Augmented Reality and Interactive Storytelling, an open source platform from the University of Wisconsin at Madison. ARIS has been used to develop [Mentira](#), [Chrono-Ops](#), and [Visitas de la colonia](#). The basics of developing a game in ARIS are surprisingly easy and can be learned in a few hours. The tool allows for creation of games with quite interesting features, that combine a virtual environment with real-world locations. QR (Quick Response) codes, for example, can be posted in designated areas, which when scanned with a camera provide information on that location or further game directions. Game players have access within the app to recording audio and video, and there is even an image matching functionality, which compares photos taken with those in the game, triggering possible game events. The authoring process itself is of course the easy part - much more difficult is devising a compelling story, finding or creating appropriate media, and deciding on user interactions. Games created with ARIS can be simple, or quite complex. *Mentira* is an example of the latter, consisting of 70 pages of dialogue and text, 150 graphics, and 4 videos. The game combines virtual experiences with real-world visits to locations in Albuquerque, New Mexico. The object of the game is to solve a murder mystery and involves students gaining information from site visits and from conversations with NPCs in the game. As is the case with all ARIS games, *Mentira* can be downloaded from the [project site](#).

This kind of place-based augmented reality game is in line with the current interest in applied linguistics in emphasizing local language experiences and in connecting academic learning to real-world experiences. *Mentira* illustrates another advantage of self-created games, easy integration into the curriculum. In this case, the game was an integral part of a fourth-semester Spanish class, with the hope that interest in the game experience might be a contributing motivating factor for students to continue their study of Spanish. Contributing, too, to that strategy was demonstrating to the students the real world, practical value of speaking Spanish, by sending them out into a local Spanish-speaking community. This moves the concept of place from its normally somewhat abstract form in the foreign language classroom to something real and meaningful. I agree with the creators of *Mentira*, that "place is not a mere particularity, an application for academic knowledge, but has a profound influence on what and how we learn, and is itself generative" (Holden & Sykes, 2011, p. 4). In fact we know that attaching learning activities to concrete places helps long-term retention.

Games developed with ARIS run exclusively on Apple iOS devices, which may be a concern depending on the intended target audience. For use on Android devices an authoring system that has seen considerable use in Europe is [e-Adventure](#), developed at Complutense University in Madrid. Games created with the e-Adventure can also be used in web browsers (through a Java applet). Since it is designed for both desktop and mobile devices, mobile games created with e-Adventure do not take as full advantage of the features of a mobile device as those made with ARIS. As is necessarily the case with template-based game authoring tools, the look and feel of the game is configurable only up to a certain extent. Here, for example, only two major 3D scenarios are available, an open outdoor environment and a closed room. Within these constraints customizations are possible. Using an authoring tool is likely the only choice for most language educators interested in creating games. Even with the head start templates or authoring tools supply, game development is still a time-consuming process. For any game project beyond something very simple, a collaborative team will be needed.

Outlook

One of the key advantages to using a self-developed game is the ability to track data in order to be able to ascertain how the game is being played, so as to correlate game activity with individual learner outcomes and attitudes. Authoring tools designed for educational use incorporate mechanisms for collecting data and for doing some kinds of assessments. They may also include means for that data to be shared with other applications, as appropriate. Most games do not have any kind of reporting out functionality, but that is possible from within self-developed game environments. A widely used protocol currently in use in education to share data among trusted applications is the [Learning Tools Interoperability](#) standard

(LTI) from IMS International. It allows, for example, third-party tools to interact with learning management systems (LMS) such as Moodle or Blackboard. Adding an LTI component to a game allows for user data to be sent to parts of LMS, including the online grade book. Information sent could include, for example, overall time spent, game levels reached, tools or services used, or even transcripts of student text input. Several games developers such as [Filament](#) and [Funbrain](#) have made their games LTI compatible.

There is currently considerable interest in the educational community worldwide in being able to save evidence of students' informal learning alongside formal institutional reports. Mechanisms and standards are being developed and deployed to make that feasible, with the goal of collecting individual learner data in an online portfolio that represents both formal and extramural learning experiences. The Council of Europe's *Autobiography of Intercultural Encounters* aims to enable that process. The information collected could very well include gameplay, particularly for educational game experiences. One of the ways that this could be done is through a successor to the [SCORM](#) specification called the [Experience API](#) or simply xAPI. This defines a standard way of recording discrete user learning experiences, whether coming from formal educational endeavors, on-the-job training, MOOC courses, intelligent tutoring programs, or virtual game environments. The structure is deceptively simple, based on the idea of triples (as in the [RDF](#) specification – resource description framework), namely actor (subject), action (verb), and result (object). This allows the flexibility for data from a great variety of activities to be represented. The data is saved to a Learning Record Store (LRS), unique to every individual. This recording system can be used on individuals or for groups of learners (data sent to multiple LRSs) and can be sent from mobile devices, or adapted for use in game consoles. Significantly, for game tracking, data can be sent from a one-time event, or recorded over a period of time. The company [Knowledge Guru](#) has integrated xAPI into their games; they feature a game creation wizard for building simple online games. The e-Adventure game authoring tool is being modified currently to use xAPI (Martínez-Ortíz et al., 2013).

The xAPI specification is similar in intent and structure to a joint project from Google, Microsoft, and Facebook called [ActivityStreams](#). It also resembles in functionality the [Gleaner](#) framework (Game Learning Analytics for Education), currently being used in the game prototype "Lost in space". Another standard that may be of interest is the [Caliper Learning Analytics Framework](#) from IMS international. It's impossible to tell at this point which, if any, of these initiatives will prove viable, as all are recent developments. Having a standard way to format and record user milestones would be helpful across a broad range of applications, services, and learning opportunities. Gaming, when used in education today, is most often an isolated activity not fully integrated into the course structure and likely not credited in the same way as other course activities. Having standard data collection methods and specifications would also be a boon to game researchers, as it would enable wider data collection as well as data sharing. Studies of gaming in the service of language learning often suffer from particularism—with results so tied to individual game experiences in a particular context that they provide little or no guidance—or from overgeneralization in the form of general findings linked to socialization, literacy gains, or growth in learner autonomy. Being able to compare results across a large number of studies of the same game (with information detailing context of use) could be helpful in resolving the current difficult questions of learning benefits from gaming: what kinds of games, what elements of games, what use of games.

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