

Weaving game and task into content-language integration: Proposing a game-mediated dual learning model

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ABSTRACT

EN Content-based instruction, task-based language teaching, and game-mediated learning are three pedagogical approaches that are perceived as effective in second and foreign language education. These approaches not only share common ground in a sociocultural and functional view of language learning but also share popularity as engaging classroom strategies in elementary, middle, and high school contexts. However, challenges may exist in ensuring content and language dual learning goals, designing language learning tasks, or implementing game-mediated activities. Therefore, this study seeks to describe the conceptual and methodological alignment among these approaches by reviewing recent research. Moreover, a game-mediated dual learning model is proposed to pinpoint a series of design components for language educators to consider when they integrate the aforementioned three approaches.

Key words: GAME-MEDIATED LEARNING, TASK-BASED LANGUAGE TEACHING, CONTENT-LANGUAGE INTEGRATION, DUAL LEARNING

ES La instrucción basada en el contenido, la enseñanza de idiomas basada en tareas y el aprendizaje basado en juegos son tres enfoques pedagógicos que se perciben como efectivos en la enseñanza de segundas lenguas y lenguas extranjeras. Estos enfoques no solo comparten una visión sociocultural y funcional del aprendizaje de idiomas, sino que también gozan de popularidad como estrategias atractivas en las aulas de primaria y secundaria. Sin embargo, pueden existir desafíos para garantizar objetivos de aprendizaje dual de contenido e idioma, diseñar tareas de aprendizaje de idiomas o implementar actividades mediadas por juegos. Por lo tanto, este estudio pretende describir la alineación conceptual y metodológica entre estos enfoques mediante la revisión de investigaciones recientes. Además, se propone un modelo de aprendizaje dual mediado por juegos para identificar una serie de componentes de diseño que los educadores de idiomas deben considerar cuando integran los tres enfoques susodichos.

Palabras claves: APRENDIZAJE BASADO EN JUEGOS, ENSEÑANZA DE IDIOMAS BASADA EN TAREAS, INTEGRACIÓN DE LENGUAS Y CONTENIDOS, APRENDIZAJE DUAL

IT L'istruzione basata sul contenuto, l'apprendimento linguistico basato su task e l'apprendimento mediato dal gioco sono tre approcci pedagogici considerati efficaci nell'insegnamento di lingue seconde e straniere. Questi approcci condividono la visione socioculturale e funzionale dell'apprendimento linguistico e risultano strategie di insegnamento coinvolgenti dalla scuola dell'infanzia alla scuola secondaria. Tuttavia, possono presentarsi delle sfide nel tentativo di garantire obiettivi di apprendimento duale di lingua e contenuto, nel progettare task di apprendimento linguistico o nell'implementare attività mediate dal gioco. Pertanto, questo studio cerca di descrivere l'allineamento concettuale e metodologico tra questi approcci esaminando ricerche recenti. Inoltre, viene proposto un modello di apprendimento duale mediato dal gioco per definire una serie di elementi progettuali che i/le docenti di lingua dovrebbero considerare quando integrano i tre approcci sopracitati.

Parole chiave: APPRENDIMENTO MEDIATO DAL GIOCO, INSEGNAMENTO LINGUISTICO BASATO SU TASK, INTEGRAZIONE DI LINGUA E CONTENUTO, APPRENDIMENTO DUALE

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1. Introduction

In light of the call for more communicative language teaching practices, three approaches have emerged over the past four decades that are considered to be effective in second and foreign language teaching and learning (L2TL). These approaches consist of content-based instruction (CBI), task-based language teaching (TBLT), and game-mediated learning (GML). They are rooted in a sociocultural orientation of learning where emphasis is placed on providing opportunities for learning through activities that are student-centered, foster social interaction, and have real-world connections. Given the theoretical alignments and methodological commonalities among these approaches, several second language (L2) scholars have already explored their relationship. For instance, Ortega (2015) commented on the special issue that made the first attempt at exploring research interfaces between the fields of TBLT and CBI¹, and suggested that educators and researchers in both subfields share the vision of the inseparability of language and meaning. Moreover, the author pointed out that the fruitful integration of new digital and social technologies has raised possibilities for innovative practices that ensure engaging and effective content-language integrated practices.

Game-mediated learning (GML) approaches have gained increased attention as an emerging technology in the field of learning in general, and more specifically in L2 research. It is argued that, with a careful design, games can promote deep and meaningful learning by immersing players in quests that prompt them to engage with active learning (Gee, 2003). Similarly, in L2 learning, game-mediated approaches not only increase learner motivation by allowing learner choices, but also provide a space for social interaction and real-world connection (Sykes & Reinhardt, 2012). Integrating these approaches can potentially create a multi-layered learning environment in which students are prompted to practice and learn both content and target language in a playful and efficient way by completing games and tasks. On the basis of this need, the present paper seeks to discuss some theoretical alignments and instances of methodological compatibility among CBI, TBLT, and GML. In the following sections, I will first provide an overview of the three approaches and their key assumptions and rationale. Next, I will explore the highlights of their compatibility of integration by reviewing the current theoretical and empirical literature. Lastly, a pedagogical model of how to use game-mediated and task-based activities to support content-language integrated learning is proposed, followed by a discussion of its implications and future implementations.

2. The three approaches

To better explain the relationship among the aforementioned three approaches, Figure 1 illustrates the overlapping connections and where the game-mediated dual learning model may be fitted. The following subsections provide a brief discussion of each approach and some of their key assumptions.

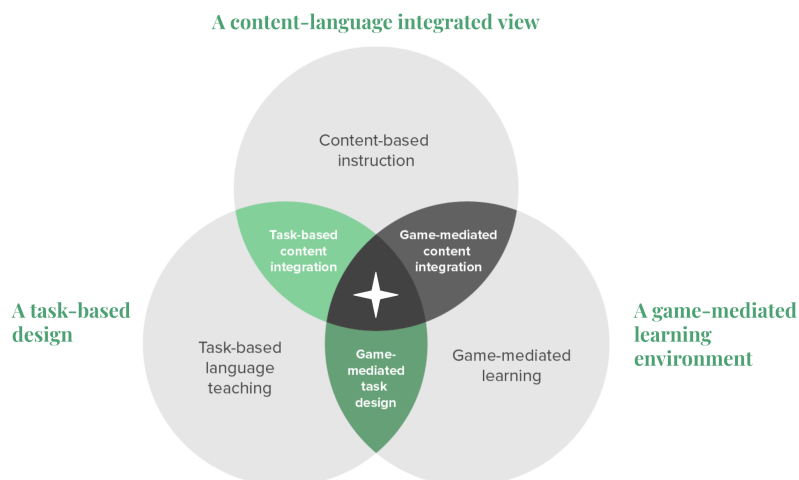


Figure 1. Visual representation of the game-mediated dual learning model

¹ The author (Ortega, 2015) used the term Content and Language Integrated Learning (CLIL) in the original article. Various terms have been used in the literature to describe the integration of content and language, yet these names refer to similar content-language integrated practices (for a more in-depth discussion on this, see Cenoz, 2015). This study therefore uses “content-based instruction” (CBI) as an overarching term that encompasses different variations of content-language integrated practices.

2.1. Content-based instruction

Originated in Canadian immersion programs, CBI refers to the concurrent study of language and subject matter (Brinton et al., 1989). The practice of CBI is supported by several second language acquisition theories and empirical studies (Grabe & Stoller, 1997). In particular, this view of ‘form plus content’, as opposed to “form versus content”, is in line with the sociocultural orientation of L2 learning. From this perspective, learning takes place when learners use language to communicate, solve problems, and engage in other meaningful activities (Banegas, 2012; Grabe & Stoller, 1997). In content-based classrooms, students are exposed to a large amount of incidental language learning through the learning of content. This incidental language learning is contextualized and embedded within relevant discourse that is specific to the subject matter. Moreover, there is greater flexibility and adaptability for teachers to build activities that promote increased opportunities to learn the targeted language through learning content knowledge, and vice versa, into the curriculum. According to Stoller (2008), CBI has been used as an umbrella term that encompasses forms of CBI ranging from the extent of immersion (e.g., 90% using the second language, content-based themes in language classes) and educational levels (e.g., preschool, higher education). To better paint the picture of these variations, Met (1999) described a continuum of content and language integration with one end being language-driven (e.g., theme-based language classes), while the other is content-driven (e.g., immersion). Depending on the curricular contexts and student population, educators have the flexibility to choose and adapt different models along this continuum to better provide opportunities for both content and language learning. In addition, the integration of content and language has commonly been recognized as content-language integrated learning in Europe, and is considered a synonym for CBI (Coyle et al., 2010; Dalton-Puffer, 2007; Ruiz de Zarobe, 2008).

2.2. Task-based language teaching

Tasks have been investigated from a sociocultural perspective to promote learning by understanding how learners make sense and learn from the tasks they are asked to perform (Ellis, 2018; Ellis et al., 2019). The central claim of sociocultural L2 learning theory is that “participants always co-construct the activity they engage in, in accordance with their own socio-history and locally determined goals” (Ellis, 2018, p. 33). Unlike the psycholinguistic view of task, performance depends on the task-participant interaction, as opposed to the inherent properties of the task itself (Appel & Lantolf, 1994). The interaction between the learners, the teachers, and the setting is crucial for task-based researchers who adopt a sociocultural orientation, and thus focus on the process of accomplishing tasks and how such a process may contribute to language acquisition (Ellis, 2018). Moreover, sociocultural-oriented scholars believe that task participants could make sense of and make attempts to perform tasks that are beyond their current abilities by collaborating with other participants in order to scaffold each other’s attempts.

According to Ellis et al. (2019), tasks can be defined based on the following criteria: 1) a primary focus on meaning, 2) the presence of a gap, 3) learners’ reliance on their own linguistic and nonlinguistic resources, and 4) a clearly defined communicative outcome. On the other hand, non-tasks or less “task-like” workplans, such as vocabulary cloze exercises, may also exist. With the advancement of technologies, tasks have been redefined in the context of technology-and-task integration. Based on prior task definitions, Gonzalez-Lloret and Ortega (2014) identified five definitional features of a technology-mediated task that is optimal for language learning, including:

- 1) a primary focus on meaning: a preplanned language goal that is embedded within the task should exist;
- 2) goal orientation: a clear communicative goal and outcomes resulting from the task should exist;
- 3) learner-centeredness: the task should be based on learners’ needs and wants, as well as allow learners to use their linguistic and non-linguistic resources to complete the task;
- 4) holism: the task should be authentic, relevant to learners, and directly related to real-world activities;
- 5) reflective learning: the task should involve cycles of reflection for learners to use their intellectual knowledge and personal growth.

As the authors suggested, technologies should be carefully chosen and planned into the tasks, rather than being used as translations or extensions of existing tasks or exercises. Moreover, different technologies (e.g., online websites, teleconferences, games) contain different affordances for L2 learning and teaching. As a result, the use of certain technologies should be justified by the degree of how they serve the overall educational purposes. To do this, we should follow the TBLT cycles that begin with needs analysis, task selection and sequencing, materials and instruction development, teaching, assessment, and evaluation (Norris, 2009).

2.3. Game-mediated language learning

By employing one of the most fast-growing emerging technologies, game-mediated learning has received expanding attention in the field of L2TL in recent years. Drawing on previous definitions, Sykes and Reinhardt (2012) pointed out several key components of a game, including voluntary play, binding rules, goal orientation, differing outcomes, and an internal rewarding system. They further emphasized that not all games contain all these features, so it is important to examine the gameplay experiences and players' behaviors to further characterize the identification of an activity that is also a game. In line with the sociocultural view of L2 learning, a game can be viewed as a social practice, a new form of literacy, and "a productive model for game-informed pedagogy that can transform language learning experiences" (Sykes & Reinhardt, 2012, p. 3). In the context of L2TL, Reinhardt (2019) drew on the ecological concept of affordance and identified a list of affordances for game-mediated L2 learning. For instance, the multimodal nature of games supports contextualized language learning, and especially the use of narratives. Moreover, games allow for goal-oriented learning and feedback mechanisms. Additionally, games provide opportunities for language development through social interaction and collaboration.

A flourishing body of research on game-mediated L2TL has been developed in and out of classrooms. To conceptualize the uses of games, Reinhardt and Sykes (2014) proposed a framework for research and practice in digital games. This framework entails three broad methods for utilizing different kinds of games and differing ways of incorporating games into curriculum. For example, game-enhanced approaches refer to the use of commercial-off-the-shelf (COTS) games that are designed for entertainment purposes. Game-enhanced research seeks to investigate how games are used for learning in the wild or how they can be adopted in L2 classrooms. Game-based practices are defined as the adoption of educational games depending on how specific game design or game-based environments can afford L2TL. Lastly, game-informed perspectives draw from game and play principles and seek to understand how to use parts of concepts of game and play to transform learning experiences. Examples of this approach include gamified learning activities and language play.

3. Blending them all

As shown in the overlapping areas in the Venn diagram in Figure 1, prior research has explored the relationships between the aforementioned approaches (e.g., task-based content integration, game-mediated task design, and game-mediated content-integration). To develop an updated understanding of the recent literature, a selective review of empirical articles that were published from 2012 to 2023 was conducted. The databases used in this study included a combination of searches in several representative journals in the field of L2 learning and teaching (i.e., *LLT*, *CALICO*, *System*, *ReCALL*, *CALL*, *TESOL Quarterly*, *TESOL Journal*, *Computer & Education*) and a key word search in Google Scholar. The search terms contained four sets of combinations that aimed to cover all studies that focused on at least two of the three approaches:

- 1) "games AND content based learning OR content based instruction OR content language integrated learning OR content integrated approaches";
- 2) "games AND task based language teaching OR task based language learning OR task based learning OR task based approaches";
- 3) "games AND content integrated approaches AND task based approaches";
- 4) "game", "play", "task", "content."

The inclusion and exclusion criteria that were followed in this review are listed below:

- 1) The search was limited to titles, abstracts, and keywords;
- 2) A focus on English as the targeted learning language was placed;

- 3) The included studies were conducted in L2 learning contexts (i.e., English as a Second Language (ESL) and English as a Foreign Language (EFL)), not when English was the students’ first language;
- 4) The included articles were limited to peer-reviewed and empirical studies (i.e., studies that reported empirical findings);
- 5) The included studies were carried out in formal classroom settings, as opposed to informal, extramural learning, or learning in the wild;
- 6) The method of intervention used in the included studies was game-mediated, as opposed to simulation or virtual worlds. Game-mediated practices include the use of entertainment, educational games, or game-/play-informed elements (e.g., gamified applications).

An overview of the included articles can be found in Table 3 in the appendix.

The analytical process involves two steps, beginning with an initial coding stage in which I reviewed and determined if the articles employed any combination of the three approaches. A total of 21 articles (n = 21) were divided into three categories according to the instructional approaches used, including i) game-mediated content integration (n = 9), ii) game-mediated task design (n = 9), and iii) game-mediated dual learning (n = 3). In the second stage, I conducted an in-depth reading of the included articles in terms of learning interventions (i.e., the game-mediated activities and tasks used in the studies), pedagogical mediation, learning outcomes, and a general description of the learning context and student population. In the next sections, I will discuss the key findings in relation to how these approaches might be used in combination with one another.

3.1. Task-based content integration

As indicated in the top left overlap in Figure 1, CBI and TBLT both appeared in the 1980s, in light of the call for more communicative language teaching methods (Bygate, 2016). These pedagogical approaches not only share roots in communicative teaching but also present commonalities that allow methodological connections to be made to maximize the potential of each approach (Lopes, 2020). By focusing on learning across disciplinary divides and through social interaction, CBI and TBLT depart from the traditional language teaching method where language is learned in isolation and relies on textbook activities (Lopes, 2020). Despite such similarities, there are four major differences in focus that lie between these two approaches, as illustrated in Table 1 (Ellis et al., 2019; Ortega, 2015). However, it is not hard to see that these differences exist at the level of focus rather than that of fundamental incompatibility. In fact, as Lopes (2020) has suggested, TBLT can be used to address some of the challenges posed by CBI. To help tackle the challenges faced by both CLIL and TBLT, researchers encouraged the combination of the two approaches. For example, Meyer (2010) suggested that the authentic communication and frequent negotiation of meaning that were fostered by language tasks enabled greater depth of content learning. Scott and Beadle (2014) also pointed out that TBLT could promote authentic communication and pushed language output through the use of the target language in interaction. Moreover, Lopes (2020, p. 8) argued that “... TBLT provides the scaffolding needed for CLIL classes to strike a balance between the cognitive and linguistic demands”.

Table 1
Comparing content-based instruction (CBI) and task-based language teaching (TBLT)

	CBI	TBLT
Conceptualizing ‘meaning’	Content and subject matter learning	Experiential and goal-oriented learning
Age groups	School age learners	College level students
Educational focus	Foreign language teaching contexts	Outside the school contexts
Educational effectiveness	Balanced and mutually beneficial learning between language and content	Transfer of learning from classroom tasks to authentic tasks in the real-world

Note. Adapted from Ellis et al., 2019, p. 18 and Ortega, 2015, p. 103.

3.2. Game-mediated task design

Comparisons have been made between the design of a game and the design of a language learning task since they are similarly goal-oriented (Purushotma et al., 2009), as depicted in the bottom overlap in Figure 1. Meanwhile, games can be perceived as more authentic and meaningful tasks as they integrate aspects of narrative, play, and social interconnectedness (Purushotma et al., 2009). Sykes and Reinhardt (2012) also sustained that games are player-driven by nature, which means they embed different means for players to create and engage with authentic experiences. By adopting games or learning from game design, we make the learning task more learner-driven by endowing them with the agency or illusion of agency that learners drive their own learning. Prior studies have attested to the similarities between game design and task design and suggested that gameplay itself can be seen as a language learning task. For example, in a study investigating the effectiveness of a digital game-based task on the acquisition of word knowledge, Rasti-Behbahani and Shahbazi (2020) adopted a commercial adventure point-and-click PC game (*Haunted Hotel: Death Sentence-Collectors' Edition*) and a walkthrough which is a guide to the game. The authors believed that adventure games are pedagogically suitable for this study because players engage with a series of tasks that require them to locate objects by searching the game interface, combining collected objects, or solving issues in previous tasks. The study recommended that a game-based task was more effective than a traditional vocabulary learning task, especially in terms of overcoming the complexity of vocabulary acquisition. With a focus on grammar learning, Kao (2020) and his collaborator (Reynolds & Kao, 2019) used an educational game (*English Extras In Business with A, An, and The*) to support the acquisition of the English article system. When designing the game used in the study, the authors foregrounded the feedback mechanic that provided both just-in-time and summative feedback. In particular, this game incorporated awareness raising and focused tasks (e.g., answering questions about specific English article uses) to ensure the practice and learning of the targeted linguistic form. Both studies reported positive effects on using the game in providing awareness-raising opportunities for the targeted linguistic form, stronger retention when combined with written corrective feedback (Reynolds & Kao, 2019), and more focused correction of article errors (Kao, 2020). Focusing on a tabletop role-playing game, McCollum (2023) identified a list of in-game tasks that are parallel to intermediate and advanced level speaking functions according to the ACTFL² proficiency guidelines. The author claimed that the value of games for L2 learning included student motivation and potential increases in their interpersonal communication skills and linguistic proficiency (McCollum, 2023).

Additionally, game-mediated task design can be developed in combination with other technological affordances, such as place-based features and augmented reality (AR). Sydorenko et al. (2019) investigated a quest-type mobile AR game (*ChronoOps*) that was designed for language learning purposes. This game was narrative-driven and intentionally designed as a series of open-ended, under-specified tasks. As the authors suggested, when games are designed to fit the conceptualization of a technology-mediated task (Gonzalez-Lloret & Ortega, 2014), they may provide useful environments for social interaction and language learning. In their study, students attended to the lexical items that were relevant to the AR tasks and physical locations. Moreover, strong goal-oriented collaboration was found between language learners and expert speakers. In short, these studies suggest that researchers tended to select or design games based on task criteria and guidelines that have been established in the task literature, and they reported the positive effectiveness of games that featured a task-based design.

In addition, having students design simple games from scratch has become a popular learning tool in fostering game-mediated task learning. In Butler's (2018) study, she invited elementary students to design computer games with potential for L2 learning based on the key elements they were asked to identify from games (e.g., challenging, instant feedback) and vocabulary learning (e.g., repeating and reviewing, multiple modalities). The author argued that it is necessary to incorporate learning elements to make activities in games into meaningful tasks for learning that require students to reflect on useful game and learning elements, and that game design is a valuable learning task. One further study recognized the coherence between the use of tasks and other L2 pedagogical approaches in the context of using games as the pedagogical intervention, and sustained that the combination of TBLT and other strategies might result in more enhanced learning outcomes (Liu & Chu, 2010). The authors designed a context-aware ubiquitous-learning environment (*HELLO*) that embedded several learning games to help engage seventh graders in different learning activities. According to the authors, ubiquitous games blend real-world and virtual environments in which players can partially play

² ACTFL stands for the American Council for the Teaching of Foreign Languages; more information on this can be found at <https://www.actfl.org/>.

games involving physical objects while playing a portion of the game involving virtual objects. The authors further explained that one of the games in this system (*Campus Story* game) was designed based on collaborative TBLT strategy in which players listened to sample stories and then collaboratively edited a story. Another study explored the combination of tasks and games in a flipped learning environment and suggested that secondary school students thus improved their communication skills and gained more confidence in speaking English (Muntrikaeo & Poonpon, 2022). The authors used a web-enhanced tool named Educaplay where teachers can create interactive learning activities for students. Several online game templates, such as matching, fill-in-the-blanks, and dialogue games, are available. These online language games are defined as activities with rules, goals, and fun elements, and used to provide a fun and more relaxing atmosphere for L2 learning (Muntrikaeo & Poonpon, 2022). In this study, tasks are described as meaning-focused activities that involve learners in understanding, manipulating, creating, or interacting in the target language to accomplish a communicative or no—linguistic result (Muntrikaeo & Poonpon, 2022). In particular, this study followed a pre-, during, and post-task design of the intervention. On the other hand, one study concluded that tasks are not always useful when compared to a self-directed approach (i.e., students do not need to follow the task sequence during gameplay) in the context of using an educational AR game-based system (Hsu, 2017).

3.3. Game-mediated content integration

As presented in the top right overlap in Figure 1, games have been utilized in supporting content learning and led to positive results in a variety of disciplines, such as mathematics, science, and social studies (Plass et al., 2020). In contrast, the use of games in facilitating content-language dual learning has rarely been discussed. Several studies have pointed out the effectiveness of serious games and how they facilitate both content and L2 learning. Serious games are typically designed for education and training purposes (Johnson et al., 2005) and are claimed to increase learning motivation and learning performance, and have the potential to facilitate subject content learning (Chen & Hsu, 2020). In Chen and Hsu's study (2020), they sought to examine if university students acquire both content and vocabulary knowledge at the same time by using an interactive serious game (*Playing History*). They recorded learning gains in both vocabulary and history knowledge, and concluded that serious game can be both fun and educational. Focusing on teaching vocabulary for specific purposes (learning nursing content), Soyoo et al. (2022) had university students play a serious game (*Saving Lives*) and suggested increased knowledge in both healthcare content and English vocabulary. Meanwhile, although other studies did not define their games as serious games, they attempted to incorporate content learning as part of the learning goals involved in the design of the games. For instance, Baturay et al. (2022) designed a 2D-mobile single player tutorial game (*ENVglish*) that aims to provide a practice opportunity for students (age 13) to develop English vocabulary, grammar, and reading skills while studying about environmental awareness. The learning of content (environmental awareness) is achieved when players answer questions about global environmental awareness to level up in the game. Moreover, Dourda et al. (2014) designed a plot-driven, web-based detective game (*Whodunit*) for students (age 11-12) to solve a number of problems that relate to the suspect's whereabouts. Throughout the completion of this game, students were able to practice the targeted language as well as the geography-related content. Additionally, students' reading skills, lexicon, motivation and collaboration were reported to be enhanced.

4. Bringing it all together: Proposing a game-mediated dual learning model

One goal of the present paper is to propose an instructional model that integrates three existing and interconnected pedagogical approaches to provide more and diverse opportunities for L2 practices. This intersection has not been systematically investigated at the time of writing this paper. The present study thus introduces a game-mediated dual learning model that utilizes the playful nature of games, applies the compatibility between game design and task design, and aims to provide more opportunities to deliver content-language integrated dual learning experiences. In this section, I will start by highlighting a few key principles from the literature on content-language integration, task, and game. I will then discuss the implementation of this model by proposing a pedagogical template. Selected examples from a classroom study will also be discussed to provide more empirical insight.

4.1. A content-language integrated view

The proposed model begins with a content-language integration component that entails the integrated view that L2 learning is enhanced in the context of subject content learning. This view moves away from the

traditional conviction that language is learned in isolation and reflects the sociocultural orientation of learning, as well as the functional view of language learning (Banegas, 2012; Grabe & Stoller, 1997). As stated in the seven strong rationales for CBI, Grabe and Stoller (1997) argued that CBI promotes incidental language learning, supports contextualized learning, offers increased opportunities for dual learning practices, and allows greater flexibility and adaptability to be built into the curriculum. This content-language integration can take place at all educational levels (e.g., elementary, secondary, higher education) and in all learning contexts (e.g., formal and informal, ESL and EFL, language and content classes). To better characterize the different possibilities of content-language integration, I adopt Met's (1999) continuum that ranges from total immersion (approximately 90% of second language instruction) to the language-driven end (language classes with frequent use of content and theme-based courses). Depending on the target student population and the particular instructional context, intermediate variations of the models exist, such as sheltered courses and adjunct models (which purposefully connect language courses with subject-matter courses). Sheltered courses are commonly implemented at secondary and post-secondary levels, especially in second language learning contexts. A sheltered course "is taught in a second language by a content specialist to a group of learners who have been segregated or 'sheltered' from native speakers" (Brinton et al., 1989, p. 15). The goal of sheltered courses is to deliver the same amount of content instruction while making an evident accommodation of the instructional language, such as using simple grammar or repetition, based on the students' level of language proficiency. Sheltered courses are therefore considered to be positioned at the content-driven end of the continua (Dueñas, 2004).

4.2. A task-based design

The second component in this model emphasizes the role of task-based design. Tasks are argued to be effective in L2 learning and teaching and have been both theoretically and empirically supported by prior literature (e.g., Ellis et al., 2019). Tasks have also been conceptualized on a continuum ranging from communicative activities that take form-focused approaches (Ellis, 2009) to everyday activities that reflect real-world interaction (Long, 1985; 2016) (Smith & González-Lloret, 2021). Within the literature on technology-mediated TBLT, González-Lloret and Ortega (2014) have recommended educators to follow the five, previously defined definitional features of a task. Among them, two features are of especially great importance in the stage of task design, i.e. being meaning-focused and goal-oriented. In determining whether a task is meaning-focused as opposed to form-focused, evidence of incidental language learning should be present even if there is a preplanned language learning goal (González-Lloret & Ortega, 2014). This means that learners participate in tasks that require them to naturally use the targeted language to solve problems. For example, in a content-driven class, students might be working on a learning task about physics but use English as the instruction and working language. When a task is meaning-focused, it is also likely to be goal-oriented, that is, to include some communicative purposes through the design of the task (González-Lloret & Ortega, 2014). The task plans offer a "language-and-action experience", which means that the decisions that learners make during the task's completion result in different outcomes (González-Lloret & Ortega, 2014, p. 6).

4.3. A game-mediated learning environment

The last component deals with the role of games in supporting task-based and content-integrated L2 learning. According to prior and current L2 research, we know that games have the potential to be used in various learning contexts with different student populations (Sykes & Reinhardt, 2012; Reinhardt & Sykes, 2014). Particularly in dual-learning environments, game-mediated activities that might promote dual learning contain either explicit and/or implicit opportunities for both content and language learning (e.g., Chen & Hsu, 2020; Dourda et al., 2014; Soyoo et al., 2022). Explicit opportunities for dual learning can be achieved by solving problems that are directly tied to the content area and/or language learning, such as using equations to solve physics problems or matching definitions to the target vocabulary. Implicit opportunities for dual learning refer to the use of content or language knowledge to solve problems, such as, using knowledge of speed and momentum to build bridges in a video game. Although students might not explicitly produce the targeted vocabulary or grammatical structures in their speech, they demonstrate an understanding of the meaning and/or usage of the linguistic form in the completion of tasks. Moreover, it is important to examine what players do when they participate in game-mediated activities and identify their affordances for both content and L2 learning. This shares similarities with task design in L2TL, in that learners engage in tasks that either target form-focused language practice or tasks that encourage learners to use the targeted language to solve problems.

4.4. Challenges in content-language integration

One challenge that exists in content-driven CBI models (e.g., sheltered courses) is the lack of knowledge and strategies necessary for teachers and L2 material designers to design and scaffold opportunities for L2 learning (Dueñas, 2004; Lopes, 2020). This lack of opportunities for language learning is not limited to sheltered courses but involves all content-driven CBI models. In fact, both content and language learning should be carefully planned because an overemphasis on content learning might hinder the accuracy and development of L2, which later affects content learning (Pica, 2002). To do so, educators could consider using game-mediated activities that help deliver learning experiences in a more playful and engaging format. Game-mediated activities refer to a careful selection of existing entertainment or educational games, or the design of wraparound activities (Sykes & Reinhardt, 2012) that are tailored to the learning targets. Examples of wraparound activities include redesigning the learning activities so as to make them about the game content and/or gameplay (e.g., write a brief reflection journal about the gameplay process and identify what physics knowledge was used) or integrating some of the game elements into the learning activities (e.g., a list of spy-themed and puzzle-based tasks designed to target both physics and English practices). Note that the incorporation of game elements here is somewhat different from gamification, which is the adding of game elements, typically incentive systems, to the existing learning activity without necessarily redesigning the activity itself (Plass et al., 2020).

4.5. Challenges in task-based design

Meanwhile, another challenge that is faced by task designers, especially those having the goals of providing ample opportunities for content-language dual learning, consists in designing tasks that are both engaging and effective (Ellis et al., 2019). Specifically, task-based instruction might not be useful when implemented alone due to a lack of opportunities to engage in tasks during instruction time, fear, shyness, or even the refusal to use the target language when performing tasks (Carless, 2002; Littlewood, 2007; McDonough & Chaikitmongkol, 2007). To help with this, educators could turn to game-mediated activities. Gameplay itself can be a language learning task. A parallel between game design and task design has long been argued by L2 scholars (Sykes & Reinhardt, 2012). Games, and especially games that are designed for entertainment purposes as opposed to educational purposes, are typically designed to prioritize content rather than form. Players interact with the game by reading or listening to the in-game dialogue or instruction, which is set in the targeted language, and making decisions on how to proceed in the game. Games may also be used as part of learning tasks that aim to deliver interactive and collaborative task experiences. In co-play scenarios (e.g., co-op, multiplayer), players interact with one another through communication, collaboration, or competition, and thus make decisions on how to play the game. Additionally, players might search for resources in the larger game community by participating in fandoms, tutorials, streamings, or other social activities. In short, games are meaning-focused, outcome-based, social activities that provide player-learners with varied opportunities for social interaction and collaboration. By participating in these problem-solving interactions, players are assumed to use some level of the targeted language if the language is part of the instruction. Apart from using games as a whole, certain elements or techniques in game design may be borrowed to enhance the design of language learning tasks. One example that has already been commonly adopted is gamification. Gamification refers to simply adding the incentive system to the learning activities without necessarily redesigning the activity (Plass et al., 2020). However, gamified products have been critically defined as “chocolate covered broccoli” (Klopfer, 2008) that might be extrinsically motivating at first but will not last long once the learners figure out that it is just another sugar-coated exercise. On the other hand, game-based learning refers to the redesigning of learning activities that either fully or partially utilize game elements. For example, game-based task design might incorporate the role of narratives and set up a fictional world in which learners take on imaginary roles and persona.

To summarize, there are three key components in this game-mediated dual learning model, namely content-language integration, task-based design, and game-mediated activities. The first component calls for an integrated view of L2 learning through the simultaneous learning of subject content. Although this model has potential for both content-driven and language-driven paradigms, the current iteration of the model emphasizes content-driven classrooms. Hence, the goal of this model is to provide opportunities for both content and language learning. The second component focuses on task-based design, as tasks have traditionally been adopted as a way to design learning activities that are goal-oriented and meaning-focused, which has shown its effectiveness in promoting dual learning. However, tasks that are created by task designers are not always perceived or implemented as engaging activities. One possible reason for this is that the tasks are

instruction-driven as compared to learner-driven; in other words, learners do not have enough agency or choice while they engage with task completion (Sykes & Reinhardt, 2012). One way to help design learner-driven tasks is to use or learn from game design in developing L2 tasks. Games are structured on the notion of providing agency, or the illusion of agency, to players. This player-driven design allows opportunities to include learners in defining their own goals of learning or carrying out the learning activities (Sykes & Reinhardt, 2012). For instance, we can give learners a selection of tasks from which to choose or offer differing paths to complete the task and reach targeted learning goals. This learner-driven design helps create tasks that are relevant to the learning goals, but also give in-depth consideration to the varied learning experiences that students might have with the tasks. As for the selection and implementation of games or game elements, Reinhardt and Sykes' (2014) framework has provided a useful guide to understand the broad uses of L2 tasks that can be designed or modified based on games that are COTS or educational, as well as wraparound activities that can be used to ensure more explicit and implicit dual learning with, through, and about games.

5. Practical implications: Introducing a game-mediated dual learning design framework

Another goal of the present study is to provide a design framework for researchers and educators using game-mediated activities in redesigning a task-based and content-integrated L2 learning environment. As shown in Table 2 below, this design framework aligns with the previously proposed game-mediated dual learning model in which three key components are described along with specific guiding questions. In the first component (i.e., content-language integration), practitioners identify their pedagogical within the content-language continuum (Met, 1998), then they individually identify opportunities for both content and language learning. I borrowed some guiding elements from Lopes' (2020) template used to design tasks for content and language-integrated learning. The second component is the incorporation of a task-based design. This component directs practitioners to think deeply about specific ways to ensure opportunities for dual learning delivery and have the potential to be authenticated by learners. To do this, practitioners first reflect on how meaning is emphasized in the tasks. In other words, they consider what kinds of explicit and/or implicit learning opportunities are present when students complete the tasks. Then, they examine the communicative goals of the tasks by focusing on which tasks promote communication and what kind of communication (e.g., collaboration, negotiation) is embedded in said tasks. Lastly, practitioners consider how these tasks can allow learners to choose and drive their own learning. The third component is the use of game-mediated activities. This component provides guidelines for practitioners to inspect game-mediated activities in terms of their affordances for content-language dual learning and task-based design. When considering the types of tasks, I adopted Prabhu's (1987) typology of task types, which include information gap, reasoning gap, and opinion gap tasks. This typology is considered the most useful source and based on how the information in a task is handled by the participants (Ellis et al., 2019).

As an addition to the explanations of each design framework component, Table 2 contains authentic examples from an empirical study that was conducted in a U.S. high school in 2022. Accordingly, I explored the use of game-mediated activities in a sheltered physics class for English language learners in a high school in the U.S. in the present study. The intervention consisted of two parts: 1) playing a video game named *Bridge Construction Portal* that is commented to practice basic physics knowledge, and 2) completing researcher-designed wraparound activities that were designed for dual-learning targets in the participating class. The video game that was used in this project was rated "very positive" in the Steam community and recommended as an online game to practice simple physics knowledge. In this game, players are new employees at a science test lab, and their job is to build bridges, ramps, slides, and other constructions based on the given materials and scenarios in the test chamber. If the construction is successful, the designed bridges safely transport the test vehicles from the entrance to the exit door; however, if it fails, the vehicles will fall into deadly acid pools. This game was selected due to its relevance in providing opportunities for utilizing simple physics concepts as well as its popularity among public players. Moreover, this is an online laptop-based game, which made it easier to implement in a classroom setting. Although this game was designed for single players, participants in this study were instructed to co-play by making design decisions and task completion decisions together.

Table 2
The design framework of a game-mediated dual learning model

Design components	Guiding questions and examples
1. Content-Language Integration	
1.1 Identify the dual learning model	<p>How is content-language integration reflected in the study? <i>This is a sheltered ELL physics course in which all students are ELLs, and the instructor is a content expert who has minimum training in working with linguistically diverse students.</i></p>
1.2 Identify opportunities for content learning	<p>What are the content learning targets?</p> <p>→ Content area: <i>High school physics</i></p> <p>→ Topic(s) or question(s) addressed (knowledge): <i>Speed and momentum</i></p> <p>→ Content skills to be developed: <i>Understand the concepts of speed and momentum (e.g., Newton's Laws) Use physics equations to solve problems about speed and momentum</i></p> <p>→ Materials: <i>A textbook titled "Physics A First Course" selected by the teacher A free online website titled "the Physics Classroom"</i></p> <p>→ Processing information from the provided materials: <i>Use Newton's third law to explain various situations Explain the relationship between Newton's third law and momentum conservation</i></p>
1.3 Identify opportunities for language learning	<p>What are the language learning targets?</p> <p>→ Specific linguistic knowledge <i>Vocabulary: Newton's third law, momentum, impulse, law of conservation of momentum</i></p> <p>→ Language learning skills <i>Be able to verbally explain the problem-solving process when working on physics problems</i></p>
2. Task-Based Design	
2.1 Focus on meaning	<p>How is language learning explicitly or implicitly designed in the task(s)? <i>Students explicitly use the targeted vocabulary and grammar during the language-oriented wraparound activities. Students implicitly use everyday English and/or science-specific English to work on tasks together during the gameplay and physics-oriented wraparound activities.</i></p>
2.2 Orient learning goals	<p>What are the communicative goals reflected in the task(s)? <i>During gameplay, students communicate with each other in deciding how to build bridges to successfully transport the testing vehicle. They may or may not use the physics vocabulary, but they will have to use physics concepts to complete the in-game quests. During the wraparound activities, students collaborate on completing the tasks. They might discuss the task completion and/or how to distribute the roles when working together. The gameplay is set up to be co-play in groups of three students. Apart from interacting with the game, players need to communicate with one another to collectively make decisions. Players will remain in the same group to complete the wraparound activities.</i></p>

2.3 Design learner-driven experiences	<p>To what degree do learners have choices to design and/or complete the task(s)?</p> <p><i>Students' learning experiences are guided by a brief story design that asks them to find the mole in their class. To do this, students will play the video game as they apply their language and physics knowledge, as well as communication and collaboration skills. In addition, students are given wraparound activities that are designed to purposefully practice their language or physics knowledge and skills.</i></p> <p><i>Instructional feedback is provided through the in-game feedback (e.g., a quick pop-up window explaining what the object is or what the next step should be), the wraparound activity hint system (e.g., special spy note providing detailed information regarding students' answers), and instructor's real-time feedback.</i></p>
3. Game-Mediated Activities	
3.1 Represent dual learning goals	<p>3.1.1 How is dual learning represented in the game-mediated activities?</p> <p><i>Content and language learning are explicitly planned in the completion of wraparound activities. These activities are designed to be either physics-oriented or language-oriented.</i></p> <p><i>Dual learning is also implicitly embedded in the play of the game. Players need to use their knowledge of the English language and physics to make decisions on how to build bridges to safely transport the testing vehicles.</i></p>
3.2 Follow a task-based design	<p>What kinds of tasks are embedded in game-mediated activities (e.g., information gap, reasoning gap, or opinion gap)?</p> <p><i>Since the game is puzzle-based, players need to analyze the given situations and make in-game decisions. When playing as a group, students make use of the information that each of them gathers while providing reasons for certain moves, and exchange options to reach conclusions.</i></p> <p><i>The wraparound activity implements a spy-themed narrative design and a hint system that requires players to solve puzzles that lead to the final secret message. For example, players will receive numbers, letters, words, or hints based on the answers they provide for the physics or language problems. These puzzles will eventually lead players to solve the question as to which of the players is a mole in this mission. By working on the physics or language-related tasks, as well as the game puzzles, students apply skills such as dissecting information, providing reasoning, and exchanging opinions.</i></p>

Note. ELL stands for English language learners.

Once the participants finished each level of the game, they were given one physics-related wraparound activity (Figure 2) and one language-related activity (Figure 3). Additional instructional support to game-mediated learning has been considered beneficial (Dixon et al., 2022; Wouters & Oostendorp, 2013), especially when using a COTS game that is not specifically designed for language learning (Sykes & Reinhardt, 2012). This study incorporated an alternating design of the learning tasks, namely, gameplay → wraparound activity → gameplay. In this manner, the target content and language skills were built into the larger gaming experience by participating in the learning activities that were designed based on the gameplay content. This alternating design is different from isolating gameplay from the supplementary instructional materials that had typically been used in previous relevant research studies. The goal of the intertwined task completion of gameplay and wraparound activities aimed at generating diverse opportunities for participants to think about science, talk about science, and do science in a fun and reflective manner. The design of the physics-related activities was based on the instructional materials used by the instructor. The language-related activities were designed to practice the targeted vocabulary, grammatical structures, as well as simple reading and writing skills, especially in the discourse of high school science. These learning targets were identified based on the instructional

materials (the knowledge and skills the instructor sustained learners already had or should have) and the game (what language or game-specific content might confuse during the gameplay).

Physics Guru

**level 1-
My First Bridge**

On the first bridge that you just built, there is a vehicle sitting still. What is its momentum?

Answer: _____ (Note: the answer should include the unit of momentum)

Write **the number** in your answer in the Spy Notes box below.

Spy notes:

Chapter 1

2

Figure 2. Example of a wraparound activity that targets physics learning

Puzzle Cracking

Q1: In Test Chamber 2, GLaDOS said “*To overcome obstacles, you will often need to construct your bridge uphill or downhill*”. What is the synonym (expression that has a similar meaning) of ‘**overcome obstacles**’?



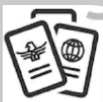






- A. beat the challenge
- B. increase chance
- C. receive another chance

Q2: During this level of gameplay, you did not destroy the components that existed in the game. Instead, you **modified** their location to construct your bridge. Which of the following sentence makes the most grammatical sense to you?


- A. We can help you modified an existing home or build a new one.
- B. Mr. Perlstein modified the curriculum yesterday because he realized the students had already mastered the concepts of momentum.
- C. The feedback will be using to modify the course for next year.

Q3: During the introduction of this game, the manager told you to not be too cozy reading construction magazines. He also said “*This series of test chambers will test your construction and deduction skills*”. What are the meanings of ‘**construction**’ and ‘**deduction**’?”

- A. damaging something; taking something away
- B. damaging something; adding in something
- C. building something; taking something away


	A	B	C
Q1			
Q2			
Q3			

1




Chapter 1


2



3



4



Spy notes:

5

Figure 3. Example of a wraparound activity that targets language learning

This project concluded with a final mission in which participants pieced together all the hints that they received after completing each wraparound activity. This hint system design was inspired by the reward system that is typically embedded in puzzle games. It motivates players internally by prompting them to discover the puzzle pieces and the hidden messages, as compared to simply adding the incentive system to the tasks. The design behind the final task also followed a problem-solving structure that had previously been introduced to the students. This structure is commonly used and taught in science education and is reinforced in this project (see Figure 4).

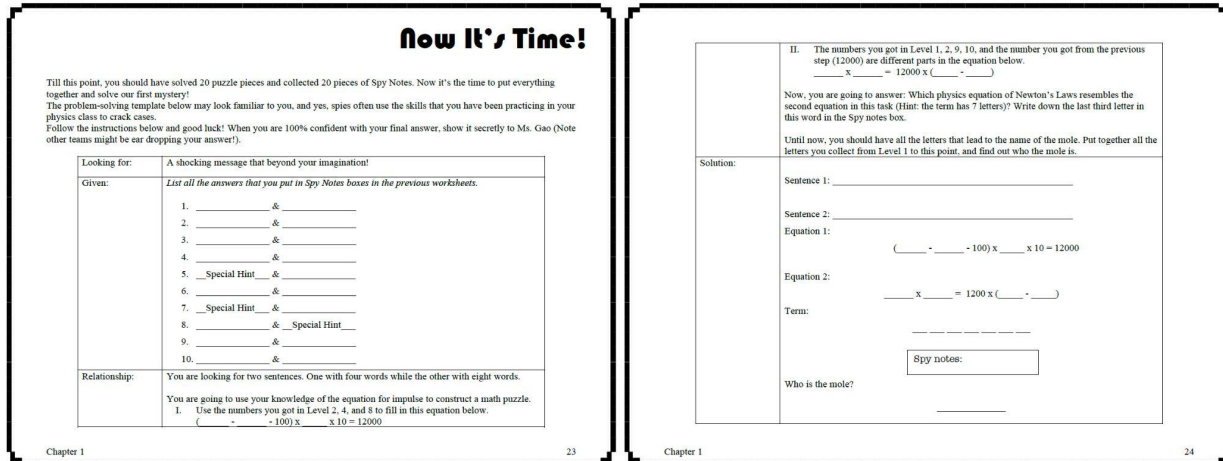


Figure 4. Final task that mirrors physics problem-solving

6. Conclusions

The present study seeks to highlight the compatibility between three existing pedagogical approaches (i.e., CBI, TBLT, and GML) in L2 education by reviewing current theoretical articles and empirical studies. In particular, this paper identifies the complementary overlaps among these approaches and introduces a potentially stronger instructional model integrating the three approaches. In addition, an instructional model of game-mediated dual learning is proposed. This model is intended not to be prescriptive or exhaustive, but rather serves as a starting point for an ongoing investigation into how to best design, evaluate, and implement game-mediated activities that are task-based in supporting content-language dual learning. For L2 researchers, this study answers the call for more investigation of the common ground and differences among L2 perspectives and approaches (Ortega, 2015) and explores the interface among three existing L2 pedagogies that hold mutual benefit to both research and educational communities. Moreover, L2 educators can benefit from using the template as a framework in guiding their understanding of how to implement game-mediated activities in their classrooms. Lastly, game designers, especially those who seek to bridge the gap between learning and game design, may also benefit from this study in learning the potential ways to implement game mechanics and the design of wraparound activities to create more and diverse opportunities for learning. Games exist in various types and genres, and provide different affordances for L2TL. As we begin to explore this new and existing field of game-mediate dual learning, it is important to remember that there is no single way of utilizing games, designing tasks, or creating dual learning experiences. Just as a group of professionals come together and work to design a game, the further development of a game-mediate dual learning model calls for a combined effort bringing different perspectives together and explores interdisciplinary issues and topics.

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Appendix

Table 3
Included publications in this selective literature review

Included databases	Included studies
<i>Language Learning and Technology</i> (LLT) V16 (2012)-V26 (current)	None
<i>Computer-Assisted Language Instruction Consortium</i> (CALICO) V29 (2012)-V39 (current)	None
<i>System</i> V40 (2012)-V108 (current)	Butler (2015) Kao (2020)
<i>Computer-Assisted Language Learning</i> (CALL) V25 (2012)-V35 (2022)	Chen & Hsu (2020) Pitura & Terlecka-Pacut (2018) Rasti-Behbahani & Shahbazi (2020) Reynolds & Kao (2021) Soyoof et al. (2022)
<i>ReCALL</i> V24 (2012)-V34 (2022)	None
<i>TESOL Journal + TESOL Quarterly</i>	Azkarai & Agirre (2016) Sydorenko et al (2019)
<i>Computer & Education</i>	Liu & Chu (2010) Fu et al. (2019) Teo et al (2022) Hsu (2017)
Other journals identified from Google Scholar	Butler (2018) Baturay et al. (2022) Chung & Chang (2017) Dourda et al (2014) Lin et al (2018) McCollum (2023) Muntrikaeo & Poonpon (2022) Thelogou & Papadopoulos (2015)

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- EN** | **Yuchan (Blanche) Gao** earned her Ph.D. in Learning, Literacies, and Technologies from the Mary Lou Fulton Teachers College at Arizona State University. Her interdisciplinary work lies at the intersection of second language acquisition and pedagogies, learning technologies (with a focus on digital games), and instructional design. She received her BA degree in Linguistics from Southern Illinois University and her MEd degree in Curriculum and Instruction and TESOL Certificate from the University of Virginia. She has worked as a secondary school ESOL instructor and curriculum director, as well as a university instructor, in the United States and China.
- ES** | **Yuchan (Blanche) Gao** recibió su doctorado en Aprendizaje, Alfabetismos y Tecnologías del Mary Lou Fulton Teachers College at Arizona State University en los Estados Unidos. Su trabajo interdisciplinario queda en la intersección de la adquisición de idiomas segundas y pedagogías, aprendizaje de las tecnologías (enfocado en juegos digitales), y diseño instruccional. Recibió su bachillerato en Lingüística de la Southern Illinois University, y su maestría en Currículo e Instrucción y certificado en TESOL (enseñanza de inglés como segunda lengua) en la University of Virginia. Ha trabajado como maestra de inglés como lengua secundaria y directora de currículo en la escuela secundaria y también como instructora a nivel universitario en los Estados Unidos y China.
- IT** | **Yuchan (Blanche) Gao** ha conseguito il dottorato di ricerca in Apprendimento, Alfabetizzazione e Tecnologie al Mary Lou Fulton Teachers College presso l'Arizona State University. Il suo lavoro interdisciplinare si trova all'intersezione tra l'acquisizione e le pedagogie di una seconda lingua, le tecnologie di apprendimento (con un focus sui giochi digitali) e la progettazione didattica. Ha conseguito la laurea in Linguistica presso la Southern Illinois University, il master in Curriculum e Istruzione e il TESOL presso la University of Virginia. Ha lavorato come docente di inglese come lingua seconda e direttrice del curriculum in una scuola secondaria e anche come docente in università negli Stati Uniti e in Cina.