Learning Content-based English in Virtual Environments

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This paper suggests how an advanced technology called pedagogical agents can be applied to English education to benefit learners across ages through computer-assisted language learning (CALL) and content-based language learning (CBLL). CALL, when designed appropriately, has positively influenced the development of a learner’s linguistic proficiency and communicative competence (Chun, 1994; Fotos & Browne, 2004). CBLL integrates language learning with subject-matter learning to make language learning more meaningful (Snow, 2001; Swain, 1998). However, the conventional CALL programs are often criticized for the lacking a social context, considered essential for successful language learning (Warschauer, 2004). Also, CBLL seems rarely applied to EFL contexts, especially Korean English Education, mainly due to the lack of resources. Pedagogical agents (PAs), defined as animated life-like characters embedded in computer-based applications, might be able to overcome those constraints. Given the similarity between human/computer interaction and human-to-human interaction in the real world (Reeves & Nass, 1996), PAs can be designed to emulate social interaction and play simulated instructional roles, through which learners may find learning English engaging and relevant.

I. INTRODUCTION

Various technologies for teaching and learning ESL/EFL have been used. Researchers acknowledge that computer-assisted language learning (CALL) plays a role for developing learners’ linguistic proficiency and communicative competence (Chun, 1994; Cummins & Sayers, 1995; Fotos & Browne, 2004, Kern, 1995; Waschauer, 1998). Emphasizing that language teaching and learning are essentially social and interactive, however, Waschauer (2004) points out that conventional CALL programs are limited in supporting social interaction and

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Kim, Yanghee; Park, Punahm; & Ko, Youngah recommends that CALL should be designed to facilitate social interaction in a meaningful context. Other things being equal, when learners are able to learn and practice English while performing authentic tasks, their learning experience is more meaningful and, consequently, their motivation to learn is enhanced. To be effective, CALL needs to be designed to support meaningful communication that is relevant to the learners’ daily tasks.

The advantages of integrating second/foreign language learning and subject matter learning have been studied under the rubric content-based language learning (CBLL) (Snow, 2001; Swain, 1998). Their studies show that CBLL provides an opportunity for learners to practice English communication in the community of a subject area and thus to build their competencies in both English usage and task performances (Swain, 2001). In many countries CBLL has been integrated into ESL in the fields of science, social science, and literature (Chamot & O’Malley, 1994; Crandall, 1987; Crandall & Kaufman, 2002). However, it seems that CBLL has not been actively applied to EFL, especially to English education in Korea. This might be mainly due to the lack of resources, in particular the lack of instructors proficient in both English and content knowledge.

In this paper the authors propose the use of an innovative technology called pedagogical agents (PAs) as way of taking advantage of the strengths and overcoming the weaknesses of CALL and CBLL in the EFL context. PAs are defined as animated human-like characters embedded in educational software (Kim, et al., 2006). As simulated beings, PAs can emulate the social roles of human instructors and peers in classrooms, in computer-based environments. What distinguishes PAs from conventional computer-based learning is their simulated social presence. In a pedagogical-agent-based environment, thus, a learner can learn instructional content while interacting with one or more PAs speaking in English. This paper will describe how PAs can be utilized in language learning and teaching, in the context of CBLL. The paper first reviews the benefits of and current trends in CALL and CBLL and then introduces the new technology of PAs and some on-going research projects using PAs. Lastly, the paper highlights the instructional implications of PAs for English education in Korea.

II. COMPUTER-ASSISTED LANGUAGE LEARNING

With the advancement of technology, computers have become an integral part of many students’ educational experiences (Cummins & Sayers, 1995; Warschauer, 1999). Consequently, researchers in language education are constantly pursuing more effective ways to utilize technology to improve language teaching and learning. Computer-Assisted Language Learning (CALL) has become a productive field in language education, increasingly requiring the researchers to be proficient in information technology as well as
to command theoretical understanding. English has been used as a primary language in information technology, so it is a tool not only for communicating but also a tool for developing and using electronic resources, in particular, those of the Internet (Warschauer, 1999). As Warschauer and Healey (1998) note, new technologies seem to stimulate changes in the pedagogy of ESL/EFL.

Warschauer (2004) delineates three stages in the history of CALL: structural CALL, communicative CALL, and integrative CALL. In the 1970s and early 1980s, structural CALL, led by structural linguists, focused on drill and practice, emphasizing language accuracy. In the mid 1980s and 1990s, communicative CALL took a cognitive view of language learning, i.e., language as an internal mental system developed through interactions with interlocutors. Language fluency was most important in this era. More recently, integrative CALL had emphasized that the main goal of communication should be to perform daily tasks and therefore that language learning should enable a learner to accomplish authentic tasks in the target language. Attention is thus paid to the content of communication as well as to the learner’s social interaction in a discourse community. In this perspective, learning a second/foreign language may naturally involve apprenticing into a discourse community of the target language; the purpose of instructional applications should be to assist a learner’s successful communication in the community.

Toward these goals, ESL/EFL researchers in CALL have been shifting their focus. Early studies, often initiated by innovative teachers, examined the quantifiable and easily measurable aspects of language such as linguistic features and functions and learning resources used in online communication (Chun, 1994; Kern, 1995; Warschauer, 1996). More recently, the researchers have paid more attention to the social and cultural contexts of language use (Kern, 2004). That is, in addition to the acquisition of linguistic forms, concepts like authentic learning, ownership of communication, situated learning, and intercultural understanding have been frequently investigated (Iwabuchi & Fotos, 2004; Kramsch, A’Ness, & Lam, 2000; Sangmin Lee, 2005). For instance, Kramsch, A’Nesse, & Lam (2000) examined the issues of authenticity and authorship with American college students learning Spanish and with a Chinese high school student who communicated in English via Internet Relay Chat. They demonstrated that the authentic texts the learners used helped them acquire seemingly useful skills in the real situations and that the need to author their own texts facilitated their engagement in active reading and writing. Belz (2002) examined college students’ intercultural competencies by analyzing the online interaction logs of German and American students communicating in English. In the study, the language choices by each group were differentiated qualitatively, indicating that the learners’ cultural backgrounds might shape--directly or indirectly--their interaction patterns.

Most important in the recent trend of CALL, social interaction in a discourse community is considered crucial for the mastery of the target language. Warschauer (2004) argues that
the goal of learning a second/foreign language should be not only to acquire the language as an internal system but also to use the language to accomplish real-life tasks in a community, which can be achieved only through dynamic social interaction in the community. Achieving these ends through content-based language teaching and learning informs the following discussion.

III. CONTENT-BASED LANGUAGE LEARNING

Content-Based Language Learning (CBLL) attempts to integrate language learning into the learning of subject matter so as to develop learners’ language skills in the context of that subject matter. In CBLL, language learning and subject-matter learning should occur concurrently. CBLL was originally devised for native English speakers to help them enhance both language skills and content knowledge. Proven successful there, it came to be used increasingly in second or foreign language learning (Brinton, Snow & Wesche, 1989). In the conventional ESL/EFL at school, learners are exposed to English separately from other academic disciplines, where they learn the language for the language’s sake. However, emphasizing the importance of language use, CBLL combines language learning and subject matter learning to help English learners acquire language skills in context, skills that will transfer to their learning other subjects.

Brinton and colleagues (1989) further highlight several advantages of CBLL. First, CBLL values linguistic structures and functions as the basis of what a learner needs to know to use the target language. Second, finding a content area relevant, CBLL is likely to motivate the learner to work in the target language. Third, CBLL may help the learner incorporate his/her background knowledge in the subject matter into learning the target language. Fourth, CBLL, emphasizing learning through contextualization, enables the learner to obtain a variety of crucial language skills in context. Lastly, because learners master new materials by using situational and verbal clues from text, they may focus more on making sense out of text. This may, in turn, encourage them to grasp meaning in the process acquiring listening and reading skills in the target language.

CBLL has stimulated a variety of instructional models in second language teaching and learning. Exemplary models include Language for Specific Purposes (LSP), English for Academic Purposes (EAP), and Immersion Program (IP). LSP provides learners with practical and experience-based instruction to increase their ability to communicate in English in the areas of technology, science, and medicine. EAP is designed to help students who want to study in English-speaking countries. In EAP, students from non-English speaking countries are trained to build English and academic skills at the same time for their future study. IP, started in Canada as a French immersion program, emphasizes
learners’ exposure to English through their communication with native speakers and is reported as successful in bilingual education.

More recently, CBLL has been enhanced by technology, especially by various online technologies. Africa Online (http://aei.uoregon.edu/safrica/index.htm) is used by 50 educators from more than 11 countries (Stroller, 2004). This online course was designed to familiarize learners both with English and with content area of civic education simultaneously. As another example, Content-based Language Teaching through Technology (CoBaLTT) was developed by The Center for Advance Research on Language Acquisition (CARLA), at The University of Minnesota in 1999. CoBaLTT was designed to better prepare K-16 foreign language teachers, giving them in-depth information in the target language with an aid of technology. The program is also accompanied by online instructional modules (http://www.carla.umn.edu).

In contrast with those trends, CBLL has not been actively applied to EFL and, in particular, to English education in Korea. As Stroller (2004) indicated, the lack of resources might be a major reason. It is often challenging for a subject-matter instructor to select or develop appropriate curriculum content and materials in English. This is because the instructor is unlikely to be proficient in both the content and the target language. To help remedy this problem, the authors propose to apply an advanced technology called pedagogical agents (PAs) that simulate human instructional roles in computer-based environments. PAs will be able to present content information, speaking in English in the acceptable manner to the discourse community. Furthermore, PAs can emulate social context, so the presence of PAs may add social richness to CALL. Equipped with PAs, CALL might integrate into CBLL more effectively and efficiently. Detailed discussions follow.

IV. PEDAGOGICAL AGENTS

1. What Are Pedagogical Agents?

Recent advances in computer and communication technology have provided opportunities to augment human cognition, interaction, and even social relations. In particular, pedagogical agents (PAs)-animated life-like characters (Johnson et al., 2000) embedded in instructional software-can be designed to simulate human instructional roles that may facilitate learners to engage in the learning task and to enhance learning in computer-based environments. Figure 1 presents examples of PAs designed to play a role of either peer or teacher (Kim, et al., 2006).
Pedagogical agents may help overcome some constraints of and expand functionalities of conventional computer-based environments. Traditionally, computer-based learning environments were tailored to meet a student’s individual needs, supporting each learner independently when the environments were well designed (Aimeur & Frasson, 1996; Anderson et al., 1995; Gertner & VanLehn, 2000; Graesser et al., 2001). However, those learning environments typically failed to provide situated social interaction, which is regarded as a significant influence on both learning and motivation (Lave & Wenger, 2001; Palinscar & Brown, 1984; Powell et al., 2003; Vygotsky et al., 1978; Wertsch et al., 1984). With the advances of technology, PAs can be designed to simulate social context in computer-based environments, playing well-defined instructional roles, following specified social conventions, and even responding to learners with apparent empathy (Hays-Roth & Doyle, 1998).

What may distinguish PAs from conventional computer-based environments would be their ability to simulate social interaction. In a pedagogical-agent-based environment, a learner grasps instructional content while interacting with one or more pedagogical agents programmed to provide information and/or encouragement, to share menial tasks, or to collaborate with the learner. Some studies indicated the positive instructional impact of PAs on cognitive and motivational outcomes (Atkinson, 2002; Kim, 2004, 2005; Moreno et al., 2001). For instance, learners exposed to an environment with a pedagogical agent demonstrated deeper learning and higher motivation than learners without an agent (Moreno et al., 2001). Students in a voice-plus-agent environment outperformed those in a text-only environment and those in a voice-only environment on both process and product measures of learning (Atkinson, 2002); similarly, students in the voice-plus-agent environment perceived worked-out examples as being less difficult than did their counterparts.

Also, findings from human/computer interaction research seem to support the educational potential of PAs to socially interact with learners. Burgoon and colleagues (2000) argue that people frequently develop a personal sense of connection and involvement with figures in the media, such as media celebrities or television characters.
Similarly, people respond to computers in fundamentally social ways: i.e., people, young or old and educated or not, often apply the same social expectations and rules to computers as they do to humans in the real world (Reeves & Nass, 1996). For instance, gender differences in the real world are projected to computing environments (E. Lee, 2003). Educated computer users apply politeness norms, notions of “self” and “other,” and gender stereotypes when interacting with computers (Reeves & Nass, 1996). This tendency seems to be stronger among inexperienced computer users, who tend to attribute more validity to computer-generated and computer-presented information than is warranted; as a result, information from computers often gains special authoritative status (Harmon, 1996). Also, Burgoon and colleagues (2000) found that computers could be more attractive task partners and more influential to decision making than human partners. In that study, credibility of the information increased as more modalities became available. From those findings, we can surmise that the messages from PAs can be at least as valid, credible, and persuasive to learners as those from their parents or teachers. Also, the simulated social presence of PAs in computing environments may provide learners with a sense of companionship and so make working in the computer-based environment more relevant and/or meaningful (Biswas et al., 2001). In the following section, two research projects that have been directed by the lead author (http://www.create.usu.edu), are introduced to help suggest the instructional potentials of PAs to be used in content-based English learning.

2. Examples of Pedagogical Agents

1) MathGirls: Learning English while Learning Math

MathGirls is an environment that can integrate math learning and English learning. In MathGirls, students use English to learn Introductory Algebra. The math content includes four one-hour lessons presented in English: Using Real Numbers (lesson 1), Combining Like Terms (Lesson 2), Factoring (Lesson 3), and Graphing (Lesson 4). Each lesson is divided into five sections by sub-topics. Each subtopic divides into Instruction and Problem-Solving. In Instruction, a female pedagogical agent named Chris overviews key instructional points of the topic in English; in Problem-Solving, students practice solving algebra problems with the assistance of Chris.

MathGirls was originally designed to provide a girl-friendly interactive math-learning environment where high school girls can get help from Chris while solving the problems. Chris, with a 3D teenage-girl-like image, provides the girls with information and encouragement to help build their positive attitudes towards learning math. Students who learn English in the environment may listen to Chris and vicariously learn her talking styles while learning math. Although the intended target of MathGirls was high school girls
whose native language is English, it can be flexibly adapted to learners’ genders and ages and to their levels of content knowledge. From the standpoint of EFL, after learning the math topics from subject-matter teachers in their own language, English learners can practice algebra problem-solving and learn algebra-content-based English in MathGirls. Figure 2 presents screen excerpts of MathGirls.

FIGURE 2
Screen Excerpts of MathGirls

The potential benefits of MathGirls for English learners are many. First, following dual-coding theory, Chris’s speech is accompanied by written texts that are presented under the image of Chris. Listening to Chris explaining math concepts, students can simultaneously read the texts. These multiple modalities of information processing and communication, typical in real life, may make the learning experience more authentic. For the learners at the lower level of English, the text messages can serve as a filler to help understand the content. Second, students learn math vocabulary naturally while listening to Chris and solving problems. An EFL student who has acquired English words in context would be expected to use them appropriately in other contexts as well. In MathGirls, students naturally acquire math vocabulary [or “terms”] while listening to Chris. Third, students can be acquainted with various English discourse styles, e.g., didactic, conversational, affective, persuasive, and so on. Chris, the pedagogical agent in MathGirls, provides three types of messages: informational, motivational, and persuasive. The informational messages are content-related, including instructions (the brief overviews of algebra topics) and feedback on students’ performances. The agent provides explanations to guide the students to problem-solving paths, which can help construct their understanding step by step. Motivational messages are verbal praise or encouragement on learner performance. When a student’s answer is correct, the agent says “Good job” or “Great, I’m proud of you”; when the student’s answer is incorrect, Chris says “Everybody makes mistakes” or “you’re almost there; one more thing
you need to consider is…” Persuasive messages, including statements about the advantages of learning math, are designed to persuade the students to sustain the learning task.

The MathGirls environment is well aligned with integrative CALL (Warschauer, 2004). In MathGirls, learning English can be meaningful and relevant because the agent, Chris, can assist learners in accomplishing authentic tasks and provide simulated social context. The learners can be exposed to a variety of discourse styles of the agent, typical in natural communication. In summary, agent/learner interactions in MathGirls are content-driven and authentic task-oriented.

2) Affective Chris

Human affect, a natural, integral part of human social and intellectual functioning, greatly influences building relations among people. Affect influences an individual’s rational thinking, decision making, social memory, judgments, and learning (Adolphs & Damasio, 2000; Forgas, 2000). More specifically, our momentary moods influence daily social interactions (Martin, 2000) and such information processing as attention, memory, and social judgments (Clore, 2001). Thus EFL learning should be fundamentally social, with learners’ affective states influencing the efficacy of learning environments. Also, an individual’s affect is closely related to and influenced by social contexts (Martin, 2000; Saarni, 2001). In conventional classrooms, the affective states of teachers and peers function as a social context, influencing a learner’s affective characteristics, e.g., the learner’s emotions, self-conception, and motivation (Sutton & Wheatley, 2003). Instructional applications that fail to accommodate the affective aspect of human learning may fail as well to accomplish their instructional goals.

Simulating human beings, pedagogical agents may model various emotional expressions and reactions to guide learners’ positive emotional experiences in the process of learning. The aim of project Affective Chris was to design an empathetic agent capable of enhancing pre-service teachers’ motivation to learn instructional design, the expectation being that the agent’s empathetic response to learners’ affective states would support learners’ interest and their self-efficacy beliefs in the tasks. Affective Chris can be an example of content-based CALL, with agent Chris helping improve the learners’ motivation toward learning the subject matter.

In the web-based module of Affective Chris, the learners’ task was to develop an instructional plan to teach sixth graders learning the economic concept of supply and demand. The module includes five steps: Introduction, Case Study, Blueprints, Plan, and Assessment, in each of which an agent, Chris, provides learners with context-specific information and suggestions in English. The steps are indicated by large buttons located at the top of the screens. In addition, to enable a learner to express his/her affective states, a
panel of emoticons (i.e., icons expressing emotions) pops up when the learner clicks a navigation button to move to the next phase. When the learner expresses affect by clicking an emoticon, the PA verbally responds. The emoticons reflected six affective states commonly occurring in learning situations, as suggested by Kort and colleagues (2001): Interest, Boredom, Confidence, Anxiety, Satisfaction, and Frustration. Results from a classroom-based experiment with 56 pre-service teachers supported the positive impact of Affective Chris. The students who worked with Affective Chris increased their interest in and their self-efficacy beliefs toward the learning task significantly more than did the students who worked with an agent not empathetically responding. Figure 3 presents the screen excerpts of Affective Chris.

![Affective Chris Screen Excerpts](image)

**FIGURE 3**

Screen Excerpts of Affective Chris

<table>
<thead>
<tr>
<th>Emoticons</th>
<th>A task screen</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Emoticons" /></td>
<td><img src="image" alt="Task Screen" /></td>
</tr>
</tbody>
</table>

V. IMPLICATIONS OF PEDAGOGICAL AGENTS FOR ENGLISH LEARNERS

As shown in the examples, learners can develop linguistic competence through simulated social interaction with pedagogical agents while performing authentic tasks. In the examples, PAs helped learners with both content and language acquisitions by verbally providing information and motivational messages that promoted learners’ cognitive and affective changes.

This section discusses more specifically how we can effectively apply PAs to EFL education in Korea. The authors first consider the challenges Korean English learners typically face when learning English and when learning subject matters in EFL contexts. They discuss how PAs can be designed to help address the challenges, summarized in TABLE 1.
TABLE 1
The Needs of English Learners and the Functions of Pedagogical Agents

<table>
<thead>
<tr>
<th>Needs</th>
<th>English learning</th>
<th>Subject-matter learning</th>
<th>Functions of PAs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive</td>
<td>Acquire linguistic knowledge of English</td>
<td>Acquire content knowledge</td>
<td>Provide information</td>
</tr>
<tr>
<td></td>
<td>Acquire language-learning strategies</td>
<td>Acquire content-specific learning strategies</td>
<td>Provide just-in-time strategies</td>
</tr>
<tr>
<td></td>
<td>Be aware of their own performance</td>
<td>Be aware of their own performance</td>
<td>Provide informative feedback about the learners’ performance</td>
</tr>
<tr>
<td>Affective</td>
<td>Reduce foreign-language anxiety</td>
<td>Reduce content-related anxiety</td>
<td>Provide motivational and persuasive messages</td>
</tr>
<tr>
<td></td>
<td>Increase language self-efficacy</td>
<td>Increase self-efficacy about the subject</td>
<td>Respond with empathy to the learner</td>
</tr>
<tr>
<td>Cultural</td>
<td>Understand the culture of the target language</td>
<td>Understand the culture of the discourse community</td>
<td>Model social roles in the community of the target culture Demonstrate the discourse conventions</td>
</tr>
</tbody>
</table>

Given the challenges of learning ESL/EFL, researchers have suggested a variety of learning strategies (O’Malley & Chamot, 1990; Oxford, 1990; Scarcellar & Oxford, 1992). Following the suggestion by O’Malley and Chamot (1990) who identify cognitive (meta-cognitive), social, cultural, and affective strategies of second/foreign language learning, the authors classify the learners’ needs into three categories: cognitive, affective, and cultural. First, a learner should recognize cognitively the linguistic features of English, including the skills of listening, reading, speaking, and writing. The learner should also learn domain-specific subject-matter information, which will later be assimilated with linguistic information into the learner’s own generic knowledge structure. These seem quite demanding mental activities, requiring the learner to adopt efficient cognitive strategies (Oxford, 1990). PAs equipped with advanced domain knowledge can share the learner’s cognitive loads by providing just-in-time information and learning strategies, thus helping expand the learner’s cognitive capabilities. In MathGirls Chris, the PA, presents math-related information and problem-solving strategies and demonstrates live use of English in context. Learners in the environment are exposed to English vocabulary [or “terms”] and expressions in the typical discourse structures of math learning. Also, Chris’s guidance is context-specific to provide the learners with just-in-time strategies, step by step, toward the right problem-solving path.

Second, affective experience is a natural process of learning (Kim & Baylor, in press). When interacting with environments, a learner may experience a variety of emotional states, such as interest, confidence, anxiety, frustration, and discouragement, all of which might influence learning and motivation. In their study, Dreyer and Oxford (1996) showed
that affective strategies were related to language proficiency. To date, however, affective support has been typically ignored in computer-based instructional applications, support that might be critical to learning unique in pedagogical agent-based environments.

Anxiety, fear of learning, is an emotional state commonly shared among learners of foreign languages. High anxiety is considered detrimental and needs to be reduced. In contrast, self-efficacy beliefs and confidence in learning are critical for successful learning of both language and subject matters. The issue of reducing anxiety and building confidence has interested CALL researchers, especially in EFL contexts (Palloff and Pratt, 1999; Warschauer, 1996). Their studies revealed that second-language learners who were often shy or lacked confidence in class participation showed their preferences for joining computer-mediated communication. This might be so because the learners do not have to feel shy with the conversational partner or embarrassed by making mistakes. When students make mistakes, a PA may offer such encouragement as, “Hey, everybody makes mistakes. Hang in there!” This kind of affective support is a unique feature of MathGirls and Affective Chris. In the environments, a main function of the PAs is to foster the positive experience of learners, encouraging them to face challenges and sustain the learning tasks. Likewise, PAs can serve students learning a subject matter in English by providing verbal encouragement, persuasive messages, and empathetic responses.

Lastly, a critical aspect of second/foreign language is to explore cultural social norms so as to better understand the target culture (Dreyer & Oxford, 1996; O’Malley & Chamot, 1990). Language use is intimately associated with verbal and non-verbal behaviors (Kramsch & Anderson, 1999). Voices, accents, talking styles, and gestures may play important roles for successful communication. It seems natural that many EFL learners have difficulties in using the target language properly in a culturally acceptable manner. A common pitfall is that the learners tend to focus on learning the language as a set of de-contextualized linguistic forms and rules and later are unable to use in real contexts. PAs can serve as social models demonstrating proper verbal and non-verbal behaviors in a given context, interacting with learners through dialogues, gestures, and facial expressions. The verbal (tone of voice and speech style) and nonverbal (facial expressions, head movements, and gestures and body movements) expressions of PAs may help EFL learners acquire socio-cultural conventions of a discourse community. By observing the PAs, the learners learn vicariously the conventions and patterns acceptable to a discourse community. For example, common discourse structures of mathematics in MathGirls include definitions, rules, theorems, examples, non-examples, and exercises. By being exposed to the structures, learners can be acquainted with Math/English in use, which will, in turn, enable the learners to perform math-related tasks properly in English. Also, exchanging emotional expressions in English seems to be more challenging than any other aspects of communication. In Affective Chris, the PA models empathic expressions in
context so that the learners can acquire competency in emotional communication.

In summary, broader exposure to authentic communication in English still challenges those charged with English education in Korea. With the advance of technology, PAs can provide an opportunity to simulate authentic use of English in virtual environments. PAs might add some degrees of social richness to CALL, effectively integrated into CBLL. Designed appropriately, PAs can help reduce the cognitive, affective, and cultural challenges of English learners in Korea.

VI. CONCLUSION

This paper proposed the potential benefits of using pedagogical agents to promote CBLL in ESL/EFL contexts. The ideal form of instruction may always be human tutoring, where a learner can benefit from individualized cognitive guidance through dynamic social interaction (Kim & Baylor, in press). Given the lack of resources for implementing CBLL in English education in Korea, however, PAs functioning as simulated instructors or peers can emulate that kind of guidance in virtual environments. Learners might be able to acquire linguistic competency while learning authentic content-related information, benefiting English teachers and learners needing both linguistic and content-related resources. Furthermore, the presence of pedagogical agents may add the social richness crucial for language learning (Warschauer, 2004) but often difficult to incorporate in traditional CALL. In line with integrative CALL (Warschauer, 2004), PAs might be able not only to present information and/or demonstrate desired performances in English but also to model social conventions of a discourse community.

Cautions should be noted. It is not the intent of this paper to suggest PAs as a panacea addressing all the many challenges of English education in Korea, nor as a tool for replacing human partners. Rather, it is suggested that this technology can effectively serve as a supplementary tool to enhance English teaching and learning, in particular in the context of CBLL. Further, PAs are a relatively new technology and somewhat limited in functioning as naturally as human instructors. PAs have been evolving with technological advancement; their instructional applications should be refined with continuous research (Kim & Baylor, in press), even more so in the context of ESL/EFL. It is recommended that active applications of PAs in teaching and learning English should be furthered with empirical evidences from rigorous research in a variety of contexts of CBLL.
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