OVERVIEW OF COMPUTER ASSISTED LANGUAGE LEARNING RESEARCH WITH SECOND LANGUAGE ACQUISITION PERSPECTIVES

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Abstract

This article discusses current CALL research with SLA perspectives. It explores the trend of CALL research and indicates restricted research methods and findings. With limitations of CALL empirical research, this paper concludes that we need to investigate CALL classroom environments with multiple factors.

Introduction

This article is to explore the trends of CALL research with SLA perspectives and the limitations of CALL studies. Teachers and researchers who are interested in improving the effectiveness of CALL environments look for guidance from second language acquisition (SLA) research with the hope that CALL activities can be designed to create ideal conditions for SLA. However, it seems that CALL studies with SLA perspectives have not reached to the desire yet. This article addresses the need for research in real language learning environments, not in the medium itself by illustrating CALL studies with three second language acquisition (SLA) perspectives: Input perspective, Output perspective, and Interaction perspectives.

Input Perspective

Input perspective states that we acquire language by using what we know couples with new information, or *i*+1. Krashen (1997) believes that language, which contains only structures that we already know, does not aid in acquisition. This is just *i.* Acquisition is a result of *i*+1, or current knowledge plus input just a bit beyond that, with the comprehensible input being the most important thing**.** Several CALL research studies conducted within an input perspective have attempted to explain the meaningful input with computer become helpful for the learner. However, all research of input perspective focused on the positive effects of computer applications comparing with conventional learning tools or methods.

In Schaefer's study (1981), he compared the computer-based semantic practice with structural practice. He claimed that practice is important for the internalization of input and meaningful practice being effective in second language acquisition. In his study, learners were subjected to two sets of computer-based drills: semantic practice and structural practice. Results indicated that semantic practice is more effective than structural practice in terms of success on semantic measures and that both kinds of practice are equally useful for structural measures (grammar tests). Thus Schaefer (1981) concluded that meaningful practice leads to the acquisition of grammar structures and further that meaningful content processing results in better understanding. This study emphasized the importance of meaningful and comprehensible input when we design the activities with the aid of a computer. However, his research is poorly designed, with the participants and tests in the study not clearly stated.

Some researchers (Johns, 1991; Dodd, 1997; Fernandez-Villanueva, 1996) have provided evidence of input perspective with the concordancing program. These studies proved Krashen's input perspective that context provides the key information necessary to allow $i+1$ input to be comprehended and incorporated into the developing languages. However, all these studies were too restricted to the effectiveness of the concordance program itself for grammar instruction. Johns (1991) and Dodd (1997) examined the practice with the aid of computer software to understand meaning and grammar. They commonly found that the teacher facilitates students to research into language without knowing in advance what rules or patterns are used. Consequently, students are encouraged to make one up in their own terms. Fernandez-Villanueva (1996) emphasized the fact that the concordancing program provides more input and motivation than regular classroom exercises in her German language classrooms. Similarly, Johns (1991) supports the view that learner's own discovery of grammar based on more input and motivation becomes central to the learning process and acquisition takes place during comprehension rather than production.

Doughty (1991) compared three kinds of computerized instruction; a rule-oriented instructional group, a meaning-oriented instructional group, and a control group. All subjects were presented the same reading texts on the computer, but the rule-oriented instructional group received explanations of the grammatical rules in relative-clause constructions, the meaning-oriented instructional group was encouraged to focus on both the content and structure, and the control group was merely exposed to the reading texts. While both the rule-oriented instructional group

and the meaning-oriented instructional group improved equally well in relative-clause and significantly better than the control group, the meaning-oriented instructional group performed best in comprehending the reading texts.

Similarly, Robinson's study (1996) employed computerized instruction to teach both simple and complex structures of English under several conditions. All subjects were presented the same target sentences on the computer, but, for example, the rule-instructed subjects were asked linguistic questions regarding the sentences, the rule-search subjects were asked if they identified any rule in the given sentences, and the implicit subjects were instructed to memorize the target sentences. The rule-instructed subjects performed significantly better than the rule-search subjects and the implicit subjects for the simple structure on the grammaticality judgment test. The rule-instructed subjects also outperformed the other groups for the complex structure although the difference was statistically significant only between the rule-instructed subjects and the rule-search subjects.

As demonstrated by all research studies above, most CALL empirical studies are focused on the use of computer application itself and instructional methods with the aid of a computer to provide comprehensible input to support learning in narrow areas. Also, findings for all meaningful use of computer application are positive. In this case, some questions are raised: how do technology-enhanced language learning (TELL) classroom environments, not a single computer application, support the input perspective for optimal language learning? What are negative results as well as positive results in TELL classrooms?

Output Perspective

The input perspective does not exclude a role for the learners' output in assisting language learning. But, from the input perspective, the role of the learners' output is usually seen as secondary and indirect. However, Swain (1985, 1995) argues "there are roles for output in second language acquisition that are independent of comprehensible input," (Swain, 1985: 248). He believes that output may be used as a way of trying out new language forms and structures as learners stretch their interlanguage to meet communication needs; they may produce output just to see what works and what does not. CALL empirical research studies on output perspective are mostly comparative studies, and there is a tendency among these comparative studies to limit the

types of CALL programs to tutorial or drill-and practice in attempting to replicate closely traditional instruction.

Swain's study (1985) emphasized the comprehensible output very well. His software use was for drill and practice because it is easy to make conclusions. He indicated that sixth-grade French immersion students perform similarly to native speakers on those aspects of discourse and sociolinguistic competence which do not rely heavily on grammar for their realization but their grammatical performance is not equivalent to that of native speakers (p. 251). The immersion students in his study received enough comprehensible input with software, but their "comprehensible output" was very limited. Swain inferred that producing language, as opposed to simply comprehending the language with software, may force the learner to move from semantic processing to syntactic processing, thereby facilitating more grammatical competence. Swain also refers to the phenomenon of individuals who can understand a language and yet can only produce limited utterances in it. A ninth-grade immersion student said, "I understand everything anyone says to me, and I can hear in my head how I should sound when I talk, but it never comes out that way," (Swain, 1985: 248). This indicates that comprehension does not necessarily transfer to production.

Van Patten and Cadierno (1993a, 1993b) examined the effects of two types of instruction, traditional instruction and processing instruction, in both interpreting and producing Spanish object pronouns in object, verb, and subject (OVS) and object and verb (OV) order. The traditional instruction involved grammatical explanations and output practice, while the processing instruction involved grammatical explanations and comprehension practice. These two kinds of instruction were also different in the grammatical information provided and the instructional approach adopted. The result of their study indicates that the processing group performed significantly better than the traditional group on comprehension post-tests and equally well on production post-tests. Van Patten and Cadierno concluded "instruction is apparently more beneficial when it is directed at how learners perceive and process input rather than when instruction is focused on practice via output," (1993a, p. 54; 1993b, p. 240).

A few years later, DeKeyser and Sokalski (1996) replicated Van Patten and Cadierno's study using two different target structures: the Spanish direct object (the same structure used in Van Patten & Cadierno's study) and the Spanish conditional, which is more complex and difficult to produce. DeKeyser and Sokalski's study eliminated extra variables by providing the same

grammatical instruction and exercise content, so the comparison was entirely between comprehension practice and production practice. The results of the immediate post-test show that for object, the input practice group performed better in the comprehension tasks and the output practice group performed better in the production tasks. For the conditional, the output practice group outperformed the input practice group in both the production and the comprehension tasks. These differences faded in the long term, however. The results indicate that "the relative effectiveness of production versus comprehension practice depends on the morphosyntactic complexity of the structure in question as well as on the delay between practice and testing" (DeKeyser & Sokalski 1996, p.231).

Nagata (1998) used two different computer applications for grammar instruction. She performed an experiment concerning the relative effectiveness of computer-assisted comprehension practice and production practice in the acquisition of a second language. Two computer programs were developed: (a) an input-focused program providing students with explicit grammatical instruction and comprehension exercises and (b) an output-focused program providing the same grammatical instruction together with production exercises. The study employed computer software to provide various types of comprehension and production tasks and examined the relative effectiveness of comprehension and production practice in the acquisition of Japanese honorifics. The results of the study suggest that given the same grammatical instruction, output-focused practice is more effective than input-focused practice for the development of skill in producing Japanese honorifics and is equally effective for the comprehension of these structures. Increased effectiveness of production practice over comprehension practice was observed in both written and oral production. The analysis of different types of exercises suggests that the relative advantage of production practice may be greater in tasks involving complex syntactic processing than in tasks requiring less syntactic processing. The results support Swain's argument that there are roles for output in second language acquisition that are independent of comprehensible input.

Kern (1995) compared web discussion with oral discussion. He found that students had from two to three times more turns (opportunities) and produced two to four times more sentences and more words in the web discussion than in the oral discussion. Similarly, Sullivan and Pratt's study (1996) provide indirect support for an increase in learner language production in the electronic mode by attesting to the drastic reduction of teacher talk in favor of student production. However, in both studies, their research methods were not appropriate. They used

several rough measures of language productivity (length of learner output in terms of number of words, sentences, and turns) that are difficult to interpret because of the lack of controlled comparisons with face-to-face language production under equivalent conditions (such as number of participants, plus or minus teacher participation, etc.).

There are also research studies that show that the first language is minimized in electronic discussion (Beauvois, 1992; Kelm, 1992; Chun, 1994; Kern, 1995). However, it is difficult to establish links between the amount of language produced and the relative time that was actually invested in it (i.e., composing messages) because of the individual freedom in electronic discussions to allocate time and effort to several tasks, such as reading others' messages, editing and revising one's own contribution before sending it, and so forth. In addition, the quantity in analyses of computer assisted discourse does not provide any indication of the extent to which the output in question is competence expanding: amount in practicing may not be relevant from a language development (Chun, 1994).

In summary, CALL studies with output perspective emphasize the importance of comprehensible output. However, like CALL research with input perspective, CALL empirical research studies with output perspective are also mostly comparative studies and there are limited to the types of CALL programs to tutorial or drill-and practice. Such experiments on learning rules of a language required learning specific aspects of a language not of the learners' choosing for short duration determined by the researcher. Although such experiments carefully model the desired cognitive characteristics for formal learning, critical elements of learner motivation and communicative language use are likely to be missing. In fact, given the artificiality of the learning situation created by the laboratory experiment, Hulstijn (1997) warns that "without additional research in real L2 learning environments, one should be extremely cautious in drawing immediate conclusions from laboratory studies to language pedagogy" (p. 132). Even, we can find similar limitations in CALL studies with interaction perspective.

Interaction Perspective

Interaction perspective has been articulated primarily through research programs on the role of linguistic input and interaction in Second Language Acquisition (SLA) in instructional settings (Gass, 1997; Long, 1996; Pica, 1994). The interaction perspective claims that linguistic input needs to become intake in order to be acquired by the learner. Intake refers to input that the

learner has comprehended both semantically and syntactically. Importantly, linguistic input that has been comprehended semantically may be of limited help to the learner because semantic comprehension is often accomplished by recognition of isolated lexical items or interpretation of non-linguistic cues with the help of existing schema (Hegelheimer & Chapelle, 2000).

Also, learners are most likely to notice linguistic form during interaction. The most useful interactions are those which help learners comprehend the semantics and syntax of input and which help learners to improve the comprehensibility of their own linguistic output. Such beneficial interactions can occur in a number of different ways depending on the situation. In face-to-face conversation, comprehension can be achieved through negotiation of meaning that occurs during communication breakdowns when learners are confused about meaning or syntax and are therefore unable to comprehend the message at first. One reason that negotiation of meaning is valuable is that it can result in modified input - input which is better tuned to the learner's level of ability. Doughty (1987) pointed out that interaction modifies through "confirmation checks, comprehension checks, and clarification requests and repetitions or paraphrases of a previous speaker's utterances" (p.155). Like other perspectives we discussed, CALL empirical studies with interaction perspective are product-oriented to evaluate the effectiveness of CALL.

The possibility of computer-mediated interaction was well illustrated by St. John and Cash (1995). Their study used analysis of texts and learner self-reports to investigate the effects of a six-month e-mail exchange between a high-intermediate learner of German and a German native speaker. The learner systematically studied the new vocabulary and phrases that he read in his incoming e-mail and stored the e-mail messages for later study. When he wrote letters, he reviewed the past messages and made special effort to put to use the new vocabulary and phrases, a process which the authors claim dramatically assisted his language learning. Even though the native speaker offered no explicit linguistic feedback, the learner was able to make many corrections, especially at the lexical level, by noticing the difference between his usage and the usage of his partner. By the end of the six months, striking progress had also occurred at the syntactic level, with the learner using more complex structures, longer sentences, more correct word order, and more natural German (St. John, Cash, 1995: 193).

Schultz (1996) tested the potential of interaction in second language writing classes, by comparing various combinations of face-to-face and computer-mediated peer review in eight

intermediate French courses. She found that for most groups a combination of the two media worked best. She claimed that face-to-face interaction, with its fast pace and fluidity, allowed students to stop frequent digressions that seem to feed positively into idea generation. Written comments focused more in depth on one or two points, and these points were more likely to be incorporated into revisions. Taken together, the two modes allowed superior co-construction of knowledge than either mode alone. The benefits of adding computer-mediated interaction as an additional component of peer review were more pronounced for students in French 4 classes than for those in French 3 classes; Schultz concluded that their higher level of language allowed them to make better use of the electronic medium for sharing of ideas. Whether the same results would result from e-mail communication remains to be seen; first language studies have indicated a superiority of e-mail to oral communication for peer review (Hartman, et al., 1991; Mabrito, 1991; 1992).

Toyoda and Harrison's study (2002) examined negotiation of meaning that took place between students and native speakers of Japanese over a series of chat conversations and attempted to categorize the difficulties encountered. The data showed that the difficulties in understanding each other did indeed trigger negotiation of meaning between students even when no specific communication tasks were given. Using discourse analysis methods, the negotiations were sorted into nine categories according to the causes of the difficulties: recognition of a new word, misuse of a word, pronunciation error, grammatical error, inappropriate segmentation, abbreviated sentence, sudden topic change, slow response, and inter-cultural communication gap. Through the examination of these categories of negotiation, it was found that there were some language aspects that are crucial for communication but that had been neglected in teaching, and that students would not have noticed if they had not had the opportunity to chat with native speakers.

Implications

As we can notice from the study examples sited above, this product-oriented approach provides outcomes from CALL applications in controlled settings. We can know the result in the specific areas by using a specific tool. However, this approach has proven unsatisfactory primarily due to inattention to the central role of the learning process and the corresponding influence of learner characteristics (Doughty, 1987). To clarify the effectiveness of the technology and understand

language learning, it is required the evaluation of classroom environment with multiple environmental elements based on empirical observation.

Then, how can we investigate language learning classroom environments? As discussed earlier, we need to explore multi-components to understand language learning classroom environments. Unfortunately, components to explore classroom environments are not clear. However, individual researchers have formed a number of environmental conditions that have an impact on students' learning differently. It might be used as a framework to explore CALL classroom environments.

Moos (1974), for example, proposes three widely used categories for describing the social climate of a classroom: (1) personal development, involving personal growth and enhancement; (2) system maintenance, which involves environmental order, control and change, and (3) relationship, which identifies interaction and support among participants in the environment. Other environmental categories which have been proposed as high-impact include engaged time, feedback, atmosphere, class management, class size, and pacing.

Spolsky (1989) presents 74 conditions for second language learning (e.g., language as system condition, native speaker target condition, variability condition, unanalyzed knowledge condition, analyzed knowledge condition, specific variety condition, academic skill condition, productive/receptive skills condition). Salomon (1992) suggests that important components of classroom environments may include task, sense of control, teacher-student interaction, student-student interaction, atmosphere, and teacher behaviors.

Chapelle (1998) suggests that seven hypotheses relevant for developing CALL environment: (1) the linguistic characteristics of target language input need to be made salient; (2) learners should receive help in comprehending semantic and syntactic aspects of linguistic input; (3) learners need to have opportunities to produce target language output; (4) learners need to notice errors in their own output; (5) learners need to correct their linguistic output; (6) learners need to engage in target language interaction whose structure can be modified for negotiation of meaning; (7) learners should engage in second language tasks designed to maximize opportunities for good interaction.

Drawing on Moos, Salomon, Spolsky, and Chapelle, a set of important environmental conditions suggested by Egbert and Hanson-Smith (1999) is considered to explore opportunities from language learning classroom environments: (1) interaction: learners have opportunities to interact

and negotiate meaning; (2) authentic audience: learners interact in the target language with an authentic audience; (3) authentic tasks: learners are involved in authentic tasks; (4) opportunities for exposure and production : learners are exposed to and encouraged to produce varied and creative language; (5) time/feedback: learners have enough time and feedback; (6) intentional cognition, learning style and motivation: learners are guided to attend mindfully to the learning process; (7) atmosphere: learners work in an atmosphere with an ideal stress/anxiety level; (8) control: learner autonomy is supported.

In summary, each element of optimal language learning classroom in some way affects the others. For example, authentic task may increase students' motivation and give more peer interactions. Naturally more feedback and less stress cause excitement for learning. These elements that were suggested by each researcher cannot present all aspects to be considered for language learning. However, it will be helpful to look at fuller views of language learning classroom environments with technology.

Conclusion

Most CALL empirical studies with three perspectives of SLA focus on the effectiveness of the medium itself, particularly in comparison with conventional teaching tools and too narrow down to the small areas. In short, CALL is seen as a treatment applied to the learner, and the effect of the treatment on learning is then measured. In this regard, Pederson (1987) points out three major trends in CALL research that might account for the nonilluminating findings concerning the impact of CALL: (a) the past studies were mostly comparative studies (CALL versus non-CALL); (b) researchers attempted to attribute learning gains to the medium itself rather than to the attributes of the CALL software used; and consequently, (c) there was a tendency among these comparative studies to limit the types of CALL programs to tutorial or drill-and practice. This technocentric approach to the evaluation of the effectiveness of CALL had proven unsatisfactory primarily due to inattention to the central role of the learning process and the corresponding influence of learner characteristics (Doughty, 1987). Therefore, it is really hard to look the fuller view of technology-enhanced language learning environments. Thus, we need empirical research on how the technology used in classrooms affects the whole language-learning environment, not just a particular factor and what changes are experienced in language classrooms with technology broadly.

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