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A corpus-based system of error detection and revision suggestion for Spanish learners in Taiwan: A case study

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Regular Paper

*Compared with English learners, Spanish learners have fewer resources for automatic error detection and revision and following the current integrative Computer Assisted Language Learning (**CALL**), we combined corpus-based approach and **CALL** to create the System of Error Detection and Revision Suggestion (**SEDRS**) for learning Spanish. Through corpus-based data training and related applications, this system was designed specially for learners of Spanish in Taiwan. The Corpus of Taiwanese Learners of Spanish (**CTLS**) was used as a database to facilitate the development of the system. The learners' corpus was tagged with part-of-speech (**POS**) and lemma information, and it was also annotated by native Spanish speakers with revisions corresponding to errors made by students in their original texts. The system can, in real time, identify tri-gram errors based on training data extracted from the revised texts of the learners' corpus and provide revision suggestions listed according to usage frequency for users. The system was evaluated by 25 Spanish learners and eight experienced programmers to quantify the system's practical effectiveness. In addition, feedback from learners' was collected to improve the system in the future.*

1. Introduction

Computer-assisted language learning (**CALL**) is defined as "applications of the computer in language teaching and learning" (Levy, 1997), and various studies have developed this concept since the 1960s, going through three main phases commonly termed behavioral, communicative, and integrative **CALL** (Warschauer, 1996). In early behavioral **CALL**, computers provided

teaching and practice materials, serving as drill tools for learners. Later, in the communicative phase, computers stimulated learners' thinking and allowed them to discover the answer or results independently. In the current phase known as integrative **CALL**, learners can, through the medium of computers, utilize multimedia, software, the Internet, and various corpora and concordances to facilitate their language learning of different linguistic aspects such as vocabulary, phrases, grammar, and collocation. In addition, corpora and related tools have played an important role in different sub-areas of linguistics because of the convenience they provide in analyzing data and reaching generalized results (Biber, Conrad, & Reppen, 1994). Because of a lack of available corpus-based error detection and revision suggestion tools, especially for Taiwanese learners of Spanish, by applying integrative **CALL** with a constructed learners' corpus, we created a preliminary tool called the System of Error Detection and Revision Suggestions (**SEDRS**) for Spanish learners. The aim of this tool is to help learners of Spanish gain lexical and grammatical knowledge of the target language. In Section 2 of this study, we review the relevant literature regarding **CALL** and corpus linguistics. In Section 3, we present the development of the **SEDRS** system and its implementation for error detection and revision suggestions for Spanish language learning. We outline the evaluation by experts and users as well as the questionnaire about the practical effectiveness of the **SEDRS** system in Section 4. In Section 5, we discuss the limitations of our findings and propose further refinements and future developments for the **SEDRS** system. We summarize the relevance and significance of our development and initial evaluation of the **SEDRS** system in Section 6.

2. Literature review

In speaking of the advantages of using computer-assisted tools to facilitate language learning, Hashemi and Aziznezhad (2011) point out that using **CALL** not only has the advantage of offering a powerful self-access facility to language learners, but also gives a new role to teaching materials. Learners can experience their individual learning styles, and also have more interaction with teaching materials than with a conventional teaching model. Learner-centeredness and interaction are two important factors, especially for the development of language production ability (Weimer, 2013). To develop writing ability, learners need to practice in a more autonomous learning environment; therefore, automatic computer-assisted tools for identifying errors and providing revision suggestions are required to satisfy individual needs in an efficient way and provide a different kind of interaction.

Meanwhile, over the last two decades, corpus-based learning approaches have drawn a lot of attention and have been adopted for various sub-areas of linguistics. With advanced knowledge of computational linguistics and integrated technology, a large amount of data can be analyzed efficiently, much faster than has ever been possible in the past. Data can be compiled for the construction of a specific corpus that can lead to conclusive generalizations in various fields of study. Without the integration of **CALL**, learners need to be familiar with the search functions and selection principles of corpus tools. Therefore, following the current trend (Johns, Lee, & Wang, 2008; Granger, 2003) of the integrative **CALL** phase, we combined a corpus-based learning approach with **CALL** to develop a system for error detection and revision suggestions that is easily accessible for language learners.

Previous studies such as Geluso (2013) and Acar, Geluso and Shiki (2011) show that using Google as corpus, by typing ungrammatical strings in the search bar and correction will be provided directly. Besides, users can observe total results of the usage and make

a revision according to frequency of Google search result. Furthermore, Wu, Witten and Franken (2010) and Shei (2008) use Google as web-based corpus to conduct search for language teaching and learning, they point out that learners get obvious progress on writing ability for collocation. Other related studies for English such as Chang, Chang, Chen and Liou (2008) indicates a corpus-based automatic collocation writing assisted system for Taiwanese EFL students by detecting and correcting errors in collocation especially for the combination of verb and noun. However, this study only emphasizes detecting and revising single unit and collocation errors. Besides, Levison, Lessard and Walker (2000) proposes an error analysis system which is able to detect lexical and morphological error for French writing and provides feedback for learners.

Research on error detection and revision for the Spanish language includes study by Bustamante and León (1996). GramCheck is considered the earliest grammar checker for Spanish (Bustamante & León, 1996). GramCheck can identify error types, including those related to gender concordance, prepositions, the passive voice, and gerunds, but it is not available for public use. Furthermore, recent resources with specific linguistic features include LoMás TV, Spanish Checker, Softpedia-Spanish 7.1, the El Corrector Spanish Grammar and Spell Checker CD-ROM, Language Tool 1.4, Free Online Spell Checker, and spellchecker.net. With regard to revising functionality, most of these tools, such as LoMás TV and Softpedia-Spanish 7.1, are limited to revising only orthographical and morphological errors and lack the ability to correct higher-level grammatical errors; for example, those involving subject-verb agreement or syntactic structure. Among those that are commercially marketed, Spanish Checker uses a whole text editor and a private mode.

Although there are a variety of applications of CALL, the limitations of CALL research cannot be ignored (Chambers, 2005; Felix, 2008; Hubbard, 2005). Furthermore, computers are limited to solving only expected and preset problems and cannot substitute for teachers. The goal of this study is to identify and correct as many learner errors as possible based on the training data.

After considering the reviewed literature we sought to integrate a learners' corpus and build an SEDRS for writers learning Spanish. We wanted to keep the design learner-centered and relevant to the learners' purpose. The corpus was therefore limited to text supplied by learners and revised by native Spanish speakers, using the revised learner materials as the source of data makes the corpus more closely related to our subject of study and more reliable for learning from a linguistic perspective than using a broader corpus such as that used by Google. With the goal of producing a computer assisted tool that detects learner errors and offers revision suggestions that span different linguistic levels in a format that can be made available for public use at no charge, the present study will answer the following research questions.

1. What are the major functions of the developed corpus-based CALL system?
2. How do these functions work in assisting learners improve their writing?
3. What are the advantages and disadvantages of the system?

3. Methodology

The method for conducting this research included two major parts, the development and then the evaluation of the system.

3.1 Developing the System of Error Detection and Revision Suggestion

To develop the **SEDRS**, we first considered the major models of intelligent computer-assisted learning systems, as described by Nyns (1989). From these, we selected a natural language interface, a pedagogical module, a model for analyzing students' errors and language acquisition and a knowledge base of the subject domain to serve as the basis for the **SEDRS**. In addition, we included functions for detecting and revising grammatical, lexical, and semantic errors based on the general category of error (Young et al., 1991). By doing so, we intended to cover general errors of different linguistic levels that Taiwanese learners of Spanish usually make. We also integrated a mechanism, as proposed by Kukich (1992), which would process language errors using the following three-step process: (1) the location of the error is determined, (2) the error is compared with an existing database based on statistical probability, and (3) the error is corrected based on contextual information.

Figure 1 shows the framework of the **SEDRS** system. The detection module identifies the dubious or incorrect segments that are present in the text. When potential errors are identified, the system searches for and displays corresponding suggestions.

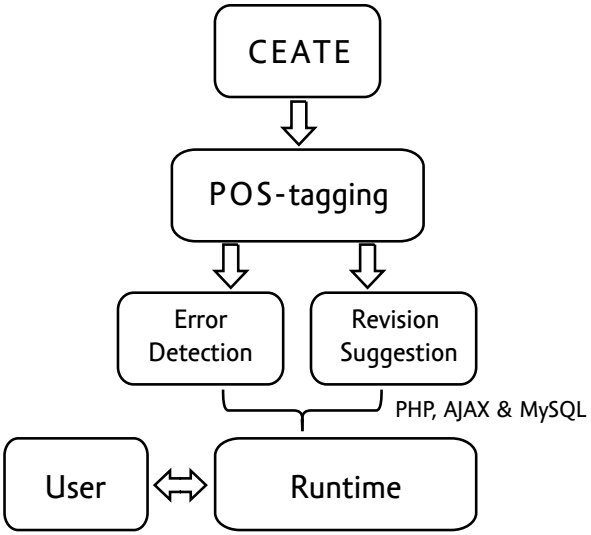


Figure 1. Framework of SEDRS

We used the Corpus of Taiwanese Learners of Spanish (**CTLS**[1]) to achieve the goals of our system. Revised texts from learner corpus were used to build a reference database for error detection and revision suggestion lists. A total of 1,058 texts and 193, 800 words were extracted from the **CTLS** as training data for the development of the system. Afterward, part-of-speech (**POS**) and lemmas were tagged and three-word sequences (tri-gram) were segmented before the program was implemented.

We collected training samples from revised texts, which were used by the computer to identify correct and incorrect data. The correct data established boundaries for comparing input texts. If input texts fell within the established boundaries, they were identified

as correct by the system. If not, the errors were filtered. The implementation was based on asynchronous JavaScript and XML (AJAX), and tri-gram structure units were adopted; i.e., every tri-gram (A+B+C, B+C+D, C+D+E) with overlapping elements was examined one by one. When users input texts, the system checked every tri-gram and compared it with the reference database. If a potential error was detected, the tri-gram was underlined to notify the user.

The revision suggestions were also generated from the CTLS revised articles. The lists were sorted according to frequency. In implementation, we used a set of hotkeys to retrieve suggestions from the database and incorporated them into the user interface. The programming languages used for revision suggestions at runtime are PHP, AJAX, and MySQL, and the PHP programming language is used to read data in the MySQL database. When the data are loaded, the system uses AJAX to detect user input.

Since the training data was originally produced by Taiwanese learners of Spanish whose native language was Chinese, this tool for error detection and revision was designed especially for Chinese learners of Spanish and then were revised by native Spanish speakers. The specific source of compiled data in the created corpus was chosen to tailor the system for Taiwanese learners of Spanish.

3.2. Evaluation

We conducted the following evaluation from two perspectives, experts and learners, so that the system can be improved in the future.

3.2.1 Expert evaluation. For feedback on technical aspects, we evaluated how users interacted with system. Lin et al. (1997) utilize a Purdue Usability Testing Questionnaire that contains criteria such as compatibility, consistency, minimal action and user guidance to evaluate human-computer interactions. We revised and translated questions into Chinese for our questionnaire (see Appendix A) and invited 8 experienced programmers from the Department of Computer Science and Information Engineering to share their opinions. The questionnaire contained nine questions. Experts provided response on a Likert scale ranging from 1 to 5: (1) Strongly disagree, (2) Disagree, (3) Neither agree nor disagree, (4) Agree, (5) Strongly agree. Not all criteria of the Purdue Usability Testing Questionnaire were included in the questionnaire; flexibility, for example, the ability to let users have a customized interface or to provide a feedback platform whenever users encountered problems is not included in SEDRS. We hope to include this feature in the future. Other criteria such as learnability (need for users to learn how to use the system), minimal memory load (need for users to remember abbreviations), and perceptual limitation (acceptance for items arrangement and color usage) were integrated these criteria into the nine questions in the questionnaire we gave to experts.

3.2.2 Evaluation by learners.

Participants and assessment design. To evaluate the practical effectiveness of the SEDRS from the user's perspective, we had twenty-five participants type sentences and then complete a questionnaire. Twenty-five Taiwanese students (20 women and 5 men between the ages of 18 and 21) from the Department of Foreign Languages of National Cheng Kung University in Taiwan participated in the evaluation. They had previously completed two semesters of Spanish (approximately 160 classroom hours) using Dos Mundos as the

textbook. An explanation (see section 4.1) and brief instruction on the use of the system were given before participants completed the test and questionnaire.

Function test. We tested the error detection and revision suggestion functions of the **SEDRS** using 16 sentences (listed in the first section of Appendix B) that contained orthographical, morphological or grammatical errors. The sentences were extracted randomly from the training data of the revised texts of the Corpus of Taiwanese Learners of Spanish. Participants were asked to type in these 16 sentences into the blank screen of the **SEDRS** (see Figure 2).

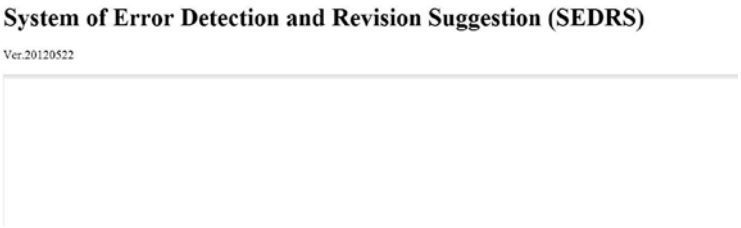


Figure 2. Blank screen of SEDRS

First, participants were asked to keep track of errors that the system detected. For each error, students chose from the list of possible corrections suggested by the system. The section was limited to 15 minutes. Then, participants were given another 15 minutes to type in an independent previously composed writing sample to test the two main functions of the system. The composition was typed in one sentence at a time. Errors in each sentence were detected and possible revisions from the suggestion list were selected before the next sentence was entered. Finally, the error detection and revision suggestion functions of the **SEDRS** were analyzed by researchers from participants' results.

Questionnaire. Students who participated in the functions tests were asked to complete a questionnaire to provide their opinion regarding user convenience of the **SEDRS**. The questionnaire included two subsections to assess user satisfaction regarding the instructions and the interface. Several open questions addressed the advantages and disadvantages of the system and elicited suggestions for future modifications. The first two sections addressed instruction assistance, functionality, and other details that were associated with (A) the instruction manual and (B) the interactive interface (Appendix C). Answers were provided on a Likert scale ranging from 1 to 5: (1) Strongly disagree, (2) Disagree, (3) Neither agree nor disagree, (4) Agree, (5) Strongly agree. The participants had 5 minutes to finish the questionnaire. For the section of open questions, we calculated the number of participants who shared the similar opinions.

4. Results and discussion

4.1 Instructions

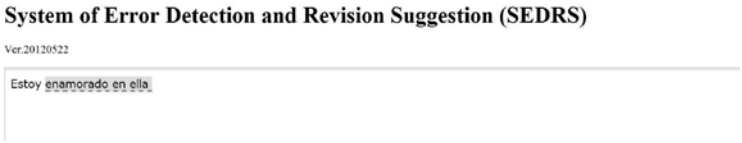
The developed system uses a check-as-you-type function, which distinguishes it from other tools described in Section 2. The instructions are shown as follows.

Instructions:
SEDRS uses a check-as-you-type function.

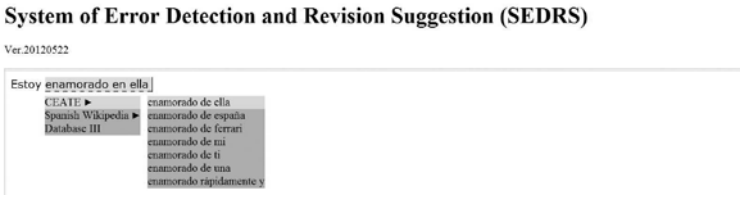
1. Users type in the panel, and **SEDRS** detects the last three words to see if there is potential error.
2. When words are underlined in red:
   a. Users can press ↓ on keyboard to view the database.
   b. Then, users can press → on the keyboard to check the suggestions list.
3. To return to the database, users press ←.

When a possible error occurs, the system responds immediately. The potential tri-gram errors, such as orthographical, morphological, grammatical, lexical and semantic errors, are underlined for notification (step 1). Users can then use the keyboard arrows to select an appropriate revision from the list (step 2). After users select a possible revision from the suggestion list, the item replaces the error (step 3).

Step 1



Step 2



Step 3

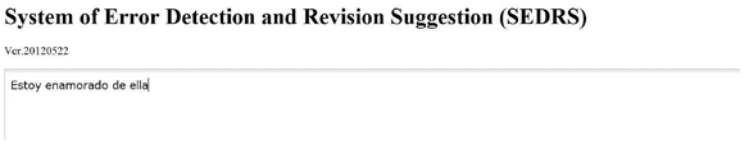


Figure 3. Instruction manual and interface

To answer research question (1), error detection and revision suggestions are two major functions of the developed System of Error Detection and Revision Suggestion (**SEDRS**), a corpus-based **CALL** system designed to assist Taiwanese learners of Spanish in Taiwan.

4.2 Evaluation

We will answer the research questions (2) and (3) through the result of evaluation task which is consisted of two parts, expert and user evaluation.

4.2.1 Expert evaluation. The evaluation results provided by experienced programmers are shown in Table 1.

Table 1: Results of expert evaluation

	Questions	Mean
1	**SEDRS** is compatible with users' computer and software.	3.5
2	Updates can be loaded easily into the system.	4.375
3	Graphics and colors are used appropriately for instructions.	4.375
4	Operations of cursor switching and panel scrolling are smooth.	3.625
5	Users can easily install the system.	4.25
6	Users can easily start and end using the system.	4.5
7	The system provides minimal steps for manipulation.	4.25
8	The information is clear, concise, and informative to users.	4.125
9	The organization is clear, logical, and effective, and easy to understand.	4

The questionnaire show that most of the experts agreed that the **SEDRS** performed well with an average score higher than 3, for the four criteria: compatibility (Q1–Q2), consistency (Q3–Q4), minimal action (Q5–Q7) and user guidance (Q8–Q9). Some of the experts were not satisfied with the compatibility because the operation of the system conflicts with Skype, which must be closed to operate the system. One expert indicated that the **SEDRS** could not be opened on a Linux operating system. Some experts suggested that the **SEDRS** should be mouse operated as well as keyboard operated. Experts reported the highest satisfaction in the areas of minimal action and user guidance, with scores above 4.

4.2.2 User evaluation.

Tested sentences. Initially, students were asked to type in 16 sentences, however, the speed with which the tool was used to reach the revision goals varied among the participants. All participants finished revising sentences S1–S10 within 15 minutes, requiring approximately 2 minutes for each sentence. However, only 36% of the participants finished all 16 sentences and most were not able to finish within the time limit. Questions S11–S16 were not completed by all the participants. Therefore, we considered only the first ten (S1–S10) sentences for our calculations and analysis. The results of our evaluation of the error detection and revision suggestion functions are presented in Table 2.

Table 2 shows distribution results of tested sentences. The system addressed sentence errors in two consecutive steps, error detection followed by revision suggestions. All the participants responded to underlined errors and selected a suggestion to correct the following error types in sentences S1, S3 and S7–S10: orthographical (S1), reflexive pronoun-verb agreement (S3), gender agreement between an article and a noun (S7), plurality agreement between an adjective and a noun (S8 and S9) and preposition usage in a verbal phrase (S10). Among the 10 sentences, the tool assisted over 90% of the participants in correctly revising

errors, such as subject-verb agreement (S2) and verb usage (S4–S6). Thus, the tool was useful for detecting and revising most types of linguistic errors.

The results of the free writing section showed the usefulness of the SEDRS to be limited. The system could successfully detect errors and provide proper suggestions to learners for the sentence contained in training data. The SEDRS requires improvement by enlarging the size of its database.

Table 2: The results of function test

Tested sentences	**Error Detection**	**Revision Suggestion**
Sentence	Correct (%)	Correct (%)
1. Es muy intresante.	25 (100%)	25 (100%)
2. Yo vive en Tainán.	24 (96%)	22 (88%)
3. Me llame XXX.	25 (100%)	25 (100%)
4. Me gusta los libros.	23 (92%)	20 (80%)
5. Me gusto voy a la playa.	24 (96%)	21 (84%)
6. Me parezco que no.	21 (84%)	19 (76%)
7. Tengo una problema.	25 (100%)	25 (100%)
8. Hay muchos gentes.	25 (100%)	25 (100%)
9. Hace muy calor.	25 (100%)	24 (96%)
10. Me gusta ir a compras.	25 (100%)	25 (100%)

Table 3: Results of questionnaire

A.	**Instruction manual**	**Mean**
1	All of the steps are included.	4.04
2	The words used in the explanation are comprehensible.	4.08
3	The illustrations are helpful for comprehension.	3.92
4	The instructions are complete and elaborate.	3.56
B.	**Interaction interface**	**Mean**
1	The tool is able to detect spelling errors.	3.6
2	The tool is able to detect grammatical errors.	2.92
3	The tool is able to detect lexical errors.	2.72
4	The suggestion list is helpful for revisions.	2.76
5	It is easy to operate the functions.	3.28
6	The reaction time of error detection is appropriate.	2.28
7	The reaction time of revision suggestion is appropriate.	2.72
8	The tool is helpful for self-learning in writing.	2.68

Questionnaire.

Satisfaction: The results of the questionnaire surveying users' satisfaction with the instruction manual and the interactive interface are shown in Table 3.

The majority of the participants selected a satisfaction level of 3 or higher with regard to the instruction manual (A1–A4), which was more positive than the satisfaction expressed for the interactive interface (B1–B8). More detailed information will be included in the

instruction manual in the future. The degree of satisfaction with the interactive interface varied between the different features of the system (B1–B8). The participants were satisfied with the straightforward use of the functions (B5) and the ability of the tool to facilitate self-learning (B8). Participants expressed satisfaction with the appropriateness of the selections provided in the suggestion list (B4). However, the participants were more satisfied with the system's ability to detect orthographic errors (B1) than its ability to detect grammatical (B2) and lexical errors (B3). The low level of satisfaction that was expressed regarding the reaction times for detection (B6) and suggestions (B7) indicates that further technical adjustments are needed. Thus, the instruction manual is comprehensible, and the interface is generally user-friendly and useful for error detection and revision suggestion over a range of linguistic categories.

Advantages and disadvantages: Detection of errors. The advantages described by the participants in the open questions included the cross-check of spelling (7 participants) and grammatical errors (6 participants). They also stated that the immediate detection of errors was advantageous because it reinforced their knowledge of grammar and usage, helping to decrease the number of subsequent errors (5 participants). Due to the detection function of the **SEDRS**, students could immediately confirm what they had written. However, if the **SEDRS** underlined the writing, it reminded users that there may be potential error, and they would think twice before repeating the same error in subsequent writing.

The disadvantages that were cited included a problem caused by the method of detecting errors instead of analyzing a sentence as a complete unit (17 participants). The evaluation results indicate that the training database was too small, which caused some incorrect detection of grammatical errors. The system lacked the necessary sensitivity (10 participants).

Advantages and disadvantages: Revision suggestions. One advantage of the revision suggestion function reported in the questionnaires was the suggestion list for revising lexical and grammatical errors (2 participants). This function was informative and offered a rich, broad range of selections to choose from (10 participants). However, participants reported that the suggestions on the list did not always correspond to the original text (13 participants), which is another indication that the database may not have been large enough to cover all possible revisions. No revision suggestions were provided for certain detected errors (1 participant), and the most appropriate candidate was not always presented as the first choice in suggestion lists (1 participant). This user feedback provides constructive suggestions for the future modification of the **SEDRS**.

5. Limitations and future work

5.1 Limitations

The limitations of the **SEDRS** primarily involve the tri-gram method of error detection and its inability to detect errors beyond the last three words that are typed. Every tri-gram needs to be examined and compared with the training data and the system cannot identify errors effectively in longer sentences or constructions that are more complex, including subject-verb inversion constructions. This was most evident in the free writing evaluation in which typed sentences were not limited to the training data.

The evaluations were limited by the number of participants. A more comprehensive evaluation with a greater number of participants (more than 30) with a wider the range of proficiency levels and from other universities in Taiwan would provide more conclusive

results. A comparison of two groups of users would be useful to verify the practical effectiveness of the developed tool.

5.2 Future work

A major objective for the future improvement of the **SEDRS** is to significantly increase the amount of training data. This should enhance the effectiveness of both the error detection and revision suggestion functions. We plan to expand the corpus of suggestion lists using Spanish Wikipedia to offer users more advanced information. Including a large-scale corpus may involve indexing technology including data compilation, parsing, and storage for a better information retrieval. We also plan to provide suggestion lists based on the results offered by Spanish collocations. Additional supplementary functions, such as a dictionary, will be added at the second stage for checking the entire texts to compensate for deficiencies associated with the tri-gram method of error detection. We will also expand our system to include a two-stage architecture. Users at the first stage can interact with the system in real time. After users finish the first stage, the system can check the entire article again for other errors, such as spelling, grammar, and verb tense.

6. Conclusion

We developed the **SEDRS** to assist learners of the Spanish language in Taiwan. This system differs from existing tools, particularly with regard to its check-as-you-type function. Based on the training results of the revised data comprised in the Corpus of Taiwanese Learners of Spanish, the primary construction is complete. Errors within three-word strings are identified, and a list of suggestions is provided by the system. Using these two major functions users can learn through writing by instantly detecting and correcting errors. This can help students avoid repeating similar mistakes. The **SEDRS** can be used as a tool for self-learning.

The evaluation and questionnaire results show that certain modifications are necessary to improve performance and efficiency of the **SEDRS**. The tri-gram reference corpus must be made robust enough to offer a wider range of error detection and revision suggestions. The list of suggestions must be presented in an order appropriate to the context, and the reaction time for checking must be reasonable. The enlargement of the training database and the addition of other types of reference sources are also required.

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Notes

1. The Corpus of Taiwanese Learners of Spanish (in Spanish, Corpus Escrito de Aprendices Taiwaneses de Español-**CEATE**) is comprised of 2,400 texts and 440,000 words since year 2005 and is a sub-corpus of the Multilingual corpora created by National Cheng Kung

University in Taiwan. All texts were part-of-speech (**POS**) and lemma tagged. It has been available for public use since 2009 (http://www.flld.corpora.ncku.edu.tw).

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(Tools)

El Corrector Spanish Grammar and Spell Checker CD-ROM http://www.translation.net/el_corrector.html
Free Online Spell Checker http://www.jspell.com/public-spell-checker.html
LanguageTool 1.4 http://www.languagetool.org/
LosMásTV http://lomastv.com/free-online-spanish-spelling-grammar-checker.php
Softpedia-Spanish 7.1 http://www.softpedia.com/get/Others/Home-Education/Ultralingua-Grammatica-Spelling-and-Grammar-Checker-Spanish.shtml
SpanishChecker http://spanishchecker.com/
spellchecker.net http://www.spellchecker.net/spellcheck/spanish_spell_checker.html

Appendix A

5 = strongly agree

1 = strongly disagree

A	**Compatibility**	5	4	3	2	1
1	該系統使用的設備是可靠的，廣泛使用的，適用於各種各樣的用途。 The equipment used by system is reliable, widely available, and applicable to a variety of uses.					
2	更新可以很容易的載入系統中。 Updates can be loaded easily into the system.					
B	**Consistency**	**5**	**4**	**3**	**2**	**1**
1	圖示或顏色的使用合乎指示的功能。 Graphics and colors are used appropriately for instructions.					
2	平移或滾動時的顯示介面一致。 The display for panning and scrolling are consistent in orientation.					
C	**Flexibility**	**5**	**4**	**3**	**2**	**1**
1	使用者能根據偏好自訂介面。 Users are allowed to customize interface according to preferences.					
2	系統提供溝通平台予使用者及開發者。 There is a system of communication between users and system developer.					
D	**Minimal action**	**5**	**4**	**3**	**2**	**1**
1	使用者能簡單地開始和結束系統之使用。 Users can easily start and end using the system.					
2	該系統提供了最簡便的步驟進行操作。 The system provides minimal steps for manipulation.					
E	**User guidance**	**5**	**4**	**3**	**2**	**1**
1	操作說明的資訊很清楚、簡潔、並具告知性。 The information is clear, concise, and informative to users.					
2	操作說明的排列方式很清楚、合乎邏輯、容易理解。 The organization is clear, logical, and effective, and easy to understand.					

Appendix B

Section 1

西班牙語「自動錯誤偵測暨修正建議工具(SEDRS)」評估

受試者編號：

日期：

A. 進行時間：15分鐘

請依序於電腦視窗中輸入以下句子，並逐一記錄。

進行步驟：

1. 於原句中根據電腦所偵測到的錯誤，於紙本句子下方畫線。
2. 選擇資料庫1 (database 1)。
3. 從建議清單中選擇適合之修正。
4. 若清單中無完全符合者，請根據建議清單上相關的修正結果潤飾所輸入的句子。
5. 將修正後的句子填入下表「修正後句子」的欄位。
6. 接續輸入下一句。

#	原句：待輸入句子	修正後句子
1	Es muy intresante.	
2	Yo vive en Tainán.	
3	Me llame XXX.	
4	Me gusta los libros.	
5	Me gusto voy a la playa.	
6	Me parezco que no.	
7	Tengo una problema.	
8	Hay muchos gentes.	
9	Hace muy calor.	
10	Me gusta ir a compras.	
11	Estoy enamorado en ella.	
12	Conocía algunos amigos.	
13	Cuando fui pequeña, era muy inteligente.	
14	Antes del salir de mi casa, no hizo nada.	
15	Espero que puede ir.	
16	Habían volvido a casa a las ocho.	

Section 2

B. 進行步驟如下，進行時間：15分鐘。
1. 逐句輸入以下的個人作文內容。
2. 於被偵測到錯誤的字串下畫線。
3. 根據建議清單於行間的空白處修正。
4. 清單上無適當之修正者，則以建議清單為參考，潤飾句子。

Un Accidente que Yo Vi

Mis compañeros de club y yo fuimos a asistir una activadad educativa en una escuela primaria el mes pasado. A las nueve de la mañana, todos los miembros esperábamos en la puerta del colegio Kuan-Fu para ir a la escuela primaria. No salimos a tiempo porque una de nuestras compañeras no llegaba. Esperaban a ella hasta las nueve y veinte. Finalmente, vimos que ella motaba la moto y esperaba a cruzar la carretera. Pero cuando ella empezó a cruzar la carretera, un carro chocó el guardafangos de su moto y ella cayó al piso.

Appendix C

C.「自動錯誤偵測、修正建議系統」(SEDRS 2.0版)使用意見調查表

***對此工具現有的功能請多包涵，但意見的表達請不必客氣、有話直說、實話實說，好幫助我們針對問題一一改善！**

☐5：非常同意、☐4：同意、☐3：普通、☐2：不同意、☐1：非常不同意

一、 操作使用說明文件

- 包含所有操作步驟 ☐5☐4☐3☐2☐1
- 文字表達淺顯易懂 ☐5☐4☐3☐2☐1
- 所搭配圖示具輔助理解的效果 ☐5☐4☐3☐2☐1
- 整體而言，詳盡、完整 ☐5☐4☐3☐2☐1

二、 系統之操作介面互動

- 能偵測出拼字的錯誤 ☐5☐4☐3☐2☐1
- 能偵測出文法使用的錯誤 ☐5☐4☐3☐2☐1
- 能偵測出詞彙使用錯誤 ☐5☐4☐3☐2☐1
- 所建議的清單對修正有幫助 ☐5☐4☐3☐2☐1
- 容易操作 ☐5☐4☐3☐2☐1
- 系統偵測錯誤所需的時間適當 ☐5☐4☐3☐2☐1
- 系統給予建議修正所需的時間適當 ☐5☐4☐3☐2☐1
- 整體而言，對寫作自學有幫助 ☐5☐4☐3☐2☐1

三、「自動錯誤偵測、修正建議系統」的優點及缺點

(一)「錯誤偵測」部分

優點：_____

缺點：_____

(二)「修正建議」部分

優點：_____

缺點：_____

四、「對自動錯誤偵測、修正建議系統」之建議及回饋

(一)「錯誤偵測」部分：

_____

(二)「修正建議」部分：

_____

感謝您協助測試與耐心填寫！