

Learners' Preferences of Conversational Strategies and L2 WTC Outcomes in Using a Dialogue Agent

Emmanuel AYEDOUN, Yuki HAYASHI, and Kazuhisa SETA

Graduate School of Humanities and Sustainable System Sciences, Osaka Prefecture University

Abstract: The aim of this research is to develop conversational agents dedicated to enhancing second language (L2) learners' willingness to communicate (WTC) in the target language. To this extent, we have so far proposed and implemented a conversational agent embedding a dialogue management model based on two conversational strategies (i.e., communication strategies (CS) and affective backchannels (AB)). Here, we report on differences observed among L2 learners' preferences of CS and AB according to their level of WTC. While the combination of CS and AB is in general the most preferred, learners' perception of the support provided by the system however, seem to vary according to their WTC level. Lower WTC learners tend to be more attached to AB while higher WTC learners seem to favor CS. Such differences may indicate the meaningfulness of tailoring the type of strategies employed by conversational agents according to the stage of development of L2 learners' WTC.

1. Introduction

The main purpose of second language (L2) learning is to give learners the ability to convey effectively their intended meaning in the target language and, by extension facilitate exchanges between people coming from different countries. MacIntyre et al. [1] suggested that the key factor ensuring a sustained L2 use is the willingness to communicate (WTC) in L2, defined as a "readiness to enter into discourse at a particular time with a specific person or persons, using an L2". WTC studies have shown that learners displaying high WTC are more likely to show more improvement in their communication skills [2] and to acquire higher levels of language fluency [3].

The ultimate goal of this research is to propose a computer-based environment dedicated to effectively enhance L2 learners' WTC in the target language. A no less important motivation is to provide such learners with a support that ideally fit their characteristics, needs, preferences in order to maximize WTC outcomes.

In our previous works [4][5], we implemented a conversational agent enhanced with a set of specific conversational strategies (i.e., communication strategies (CS) and affective backchannels (AB)) dedicated to carry on WTC-friendly conversations with learners in an English-as-a-foreign-language context. An experimental evaluation of the system confirmed the practical significance of using such conversational strategies enhanced dialogue agent to foster L2 learners' WTC [5].

However, we are aware that L2 WTC is influenced by a complex interplay of interacting learner specific internal and external variables [6]. Thus, while the combined effect of CS and AB may predict raise of WTC among L2 learners, it might be erroneous to firmly conclude that all L2 learners interacting with our proposed system perceived or benefited similarly from the effects of such strategies. For instance, it is conceivable that some learners might benefit more from the usage of AB, while others might rather be more influenced by the usage of CS and so on.

In the present study, we take a closer look at learners' perceptions of the support provided by each of the above mentioned strategies or combination of strategies (i.e., AB and or CS), and investigate differences in preferred strategies according to learners' WTC levels. We finally discuss on the feasibility to achieve a tailored deployment of these conversational strategies accordingly with learners' preferences and actual level of WTC.

2. Literature Review

2.1. Individual differences in language learning

According to Lombaard [7], language learning styles characterize the consistent and rather enduring traits, tendencies, or preferences that may differentiate a learner from another. Oxford [8] argues that language teachers need to be aware of such differences as she believes that a single L2 methodology cannot reasonably fit an entire

class filled with students who have a range of stylistic and strategic preferences. Zafar [9] stresses that in order to maximize learning outcomes, it is important for teachers to modify their teaching methodology according to the factors related to the individual tendencies, preferences of their students. All of these positions tend to confirm a link between learners' styles, preferences on one hand, and effectiveness of the teaching methodology on the other. This further suggests the necessity to take a personalized approach to language teaching in order to help learners reach higher learning outcomes. In a similar vein, one can assume that depending on the level of WTC reached by L2 learners, it might be desirable to provide them with a support that fit better their preferences.

However, in the field of second language acquisition, individual differences research has generally been focused on explaining the processes of learning and acquisition, rather than looking for practical ways to improve them [10]. As a result, even though all language teachers would quickly agree that learners differ from one another, most of language teaching materials have assumed that all learners are the same [11].

More generally, the major pedagogical implication of learners differences (i.e., personalization of learning contents) is difficult to realize in usual classroom settings as it would result in additional workload for teachers [10]. This would also require for teachers to have the necessary motivation for such work, as well as enough pedagogical resources to help each learner get such a personalized instruction. The necessity to overcome such difficulties became one of the key factors of the development of the so called adaptive learning systems.

2.2. Adaptive learning systems

The purpose and promise of adaptive learning technologies is to facilitate online instruction that is personalized to the needs of individual learners [12]. Such systems have been found to be useful in engaging the learner in the educational experience [13][14]. Several factors including instructional methods, learning objectives, pace, order, feedback, can be tailored to meet individual needs of learners, and hence achieve different types of personalization in learning [13]. Although different levels and types of personalization of learning contents exist, the adaptive nature of such systems is not necessarily determined by their level of sophistication. For instance, while complex systems can use artificial intelligence and machine learning algorithms to analyze

and find patterns in the huge amounts of data being captured, the simplest adaptive systems are based on predefined models describing how the data from an individual learner can lead to personalized learning pathways.

Although the use of adaptive technologies in learning is growing rapidly, it is still in its infancy as far as language learning is concerned, as evoked by Kerr [15]. Furthermore, a major problem of research dealing with adaptive language learning is that such technologies have not been deployed for long enough to permit reliable longitudinal research findings. Moreover, there are many challenges in developing fully adaptive learning systems since it is very difficult in practical terms to restrict the number of variables to account for the personalization of instructional contents, especially in L2 learning.

More or less successful systems in the area of language learning tend to personalize learning contents by focusing on learners' performance. For example, some vocabulary or grammar apps provides automated spaced repetition, which consists in tailoring the order and the frequency with which learning contents are presented to the learner by using the rate of right or wrong answers. In this sense, such systems are personalized and adaptive learning tools, of an admittedly fairly simple nature [15]. In such way, the focus of adaptive language learning systems has been mostly on leveraging the technology to support the learner's knowledge of language (i.e., grammar, vocabulary), rather than on supporting aspects related to communication or learners' motivation towards language use, which is precisely the main interest of our work.

2.3. Enhancing L2 learners' WTC with a conversational agent

In order to enhance L2 learners' willingness to interact in the target language, it is important to increase their self-confidence and reduce their anxiety since there is much evidence that if communication apprehension recedes, an individual's perceived communicative competence is likely to be higher, leading to a greater level of WTC [16]. To achieve such affective support, the system which interface is shown in Figure 1 was proposed in our previous work [5]. It is a conversational agent that makes usage of two conversational strategies namely Communication Strategies (CS) and Affective Backchannels (AB) in realistic daily conversation scenarios to motivate L2 learners towards communication in English. The rationale of implementing such strategies

Table 1 Examples of CS and AB implemented in the conversational agent.

	Strategy	Description	Example
CS	Simplification	Use an alternative or a shorter term, which express the meaning of the target lexical term	Agent: May I have your order please? Learner: ... (silent) Agent: Order please.
	Asking clarification	Request an explanation of an unfamiliar meaning structure	Learner: One xxx please. Agent: What do you mean?
AB	Encouraging AB	Employed when the learner seems to hesitate to the extent that he/she remains silent	<ul style="list-style-type: none"> • Come on! Don't be shy... • You can do it... •
	Sympathetic AB	Employed when the learner's utterances does not match the agent's expectations	<ul style="list-style-type: none"> • Sorry I couldn't get you dear... • Oops, I'm afraid I missed something •



Figure 1 System interface featuring Peter.

can be explained in terms of increasing L2 learners' confidence via CS and reducing their level of anxiety towards communication via AB. As follows, both of these conversational strategies have theoretically different roles to play in enhancing learners' WTC. We examined learners' expected WTC after interacting with one of the following versions of the system: an agent featuring both CS and AB; an agent featuring only CS; and an agent featuring only AB. The results suggested that the system combining CS and AB was the most effective in terms of WTC outcomes, and also the most preferred by learners.

However, we should bear in mind that the reasons behind such experimental results may not be homogeneous among all learners. We cannot especially rule out the hypothesis that although most of learners preferred the combination of CS and AB, the relative effect of one strategy or another may be dependent on complex personal factors proper to each learner. A first step towards implementing a L2 learners adapted WTC support in our current system, consists in exploring ways to enable the dialogue agent to account for such learners' differences in the dialogue management.

3. Objective and Research Questions

In the lights of findings and limitations of the different studies mentioned above, our proposal aims to contribute to the research on adaptive language learning systems by exploring some possible ideas to account for L2 learners' differences in enhancing their WTC with a dialogue agent. As pointed out by Hinton [10], examining learners' feeling about the teaching methodology may help remove or emphasize certain elements in order to create and preserve positive emotional responses. For instance, the current study aims to investigate differences in L2 learners' perception of the support provided by the dialogue agent via CS and AB, and implications of such perception on the feasibility to provide them a more adapted WTC support.

We examine the following research questions:

1. What are the differences in L2 learners' perceptions or preferences of the WTC support provided by the system?
2. How do WTC outcomes vary according to such L2 learners' differences?
3. How can we tailor the WTC support provided by the system towards accounting for L2 learners' differences?

Since WTC is believed to be influenced by a complex combination of affective factors (mainly anxiety and self-perceived communicative competence) proper to each learner, we hypothesize that L2 learners, based on their level of WTC may have a relative preference for a given category of conversational strategies over another one. Such learners' preferences tendencies, if established, may further help us tailor or balance the usage of CS and or AB

Table 2 Overview of the experiment flow.

Phase	Steps	Group 1(G1) (n=10)	Group 2(G2) (n=10)	Group 3(G3) (n=10)	Group 4(G4) (n=10)	Group 5(G5) (n=10)	Group 6 (G6) (n=10)	
Phase 2	Phase 1	Step 0	First WTC questionnaire (Pretest)					
		Step 1	Warm-up interaction with the system					
	Step 2	CS+AB	CS+AB	CS	AB	CS	AB	
	Step 3	Second WTC questionnaire (Posttest)						
	Step 4	CS	AB	CS+AB	CS+AB	AB	CS	
	Step 5	System preference survey						

according to each learner’s preference in order to maximize outcomes in terms of WTC.

4. Methodology

4.1. Conversational agent

We used the same embodied conversational agent as in our previous work [5]. The system makes possible spoken dialogues between the conversational agent, personified as Peter, and learners in a restaurant context. The conversation scenario begins with an entrance scene where learners are welcomed by Peter. After checking whether they have a reservation or not, they are guided to a table in their preferred area (i.e., smoking, non-smoking). From there, learners can call Peter anytime, ask for the menu, order drinks, dishes of their preference, and request the bill, just as they would do in a restaurant. During the interaction, learners were able to answer Peter’s questions or take the initiative to ask questions or make orders.

4.2. Design

The flow of the experiments was designed according to two phases so as to compare learners’ WTC results across different versions of the system on one hand (Phase 1), and examine their preference after interacting with different versions of the system, on the other (Phase 2), as shown in Table 2.

During Phase 1, we gauged learners’ WTC by administering a self-report survey [17] before (Step 0) and after (Step 3) their first interaction with the system (Step 2). The WTC surveys targeted three variables: *confidence*, *anxiety*, and *desire to communicate (desire)*, which are considered to be the immediate precursors of WTC [18]. Participants were asked to rate 30 scenarios (e.g., making a telephone call to make a reservation at a hotel in an

English-speaking country) related to using English in various circumstances on a four-point Likert scale (0-3). Note that that the two WTC questionnaires (i.e., Pretest and Posttest), although asking similar questions, were different in the sense that the first asked for learners’ actual WTC, whereas the second asked about learners’ expected WTC after using the system for a while. In Step 2, multiple system versions, including the normal version featuring both CS and AB (CS+AB), a second version featuring only CS, and a third version featuring only AB, were employed in the interactions so that we could examine how the outcomes on participants’ WTC varied with the system version. Here, participants interacted individually with the system in a room specially prepared for the evaluation and were given as much time as they wished to enjoy the conversation with the agent, until the end of the interaction. They were also informed that they were free to interrupt the interaction at any time they desired, but were requested to let us know beforehand.

To complete Phase 2, we let all participants have a second round of interactions with another version (i.e., different from the one used for their first interaction) of the system (Step 4). We then conducted a survey to get feedback concerning their preference on the system’s versions (Step 5). All participants were asked to choose which one of the two interactions (i.e.: which version of the system) they preferred the most as well as the reason supporting their choice. For example, participants in Group 1 had actually to choose between the CS+AB and the CS versions, those of Group 2 between the CS+AB and the AB versions, and so on for participants in other groups. To minimize the eventuality that learners’ preference would be due to only the order in which they interacted with different versions of the system (i.e., order

effect), the learners' interactions with the system in each group were designed by applying the counterbalancing method proposed by Howitt and Cramer [19].

4.3. Participants and data collection

A total of 60 male and female university students' data were gathered and used in this study. Since experiment data for participants of group 1 to 4 were already collected in our previous work [5], we just ran additional experiments to collect data for those of group 5 and group 6. Identically to groups 1-4, participants of groups 5 and 6 were also quite homogeneous in terms of language background; all of them were native Japanese speakers and none had lived in an English-speaking country. They were informed that their participation in the study was voluntary and that the results would be anonymized. To preserve uniformity of conditions across the two studies, we also rigorously made sure to have the same experimental settings as in our previous works for this new round of experiments as well. Moreover, a one way ANOVA was conducted and confirmed the homogeneity of initial WTC conditions (First WTC questionnaire) among the six groups. In detail, the tests revealed there were no statistically significant differences among the groups in terms of initial *confidence* [$F(5,54)=1.85, p=.12$], *anxiety* [$F(5,54)=0.44, p=.81$], and *desire* [$F(5,54)=1.36, p=.25$].

Note that while the focus of our previous work was mainly on evaluating the effectiveness of the combination of CS and AB in fostering learners' WTC, the current study focuses rather on analysis of differences in learners' preferences of these conversational strategies, and exploring the feasibility to account for such differences to achieve a personalized support towards increasing L2 learners' WTC.

4.4. Results

Learners' WTC level and preference differences

In order to investigate differences in learners' preference of CS and or AB versions of the system, we had a look on results of the system preference survey (Step 5) with respect to learners' initial WTC level. To that extent, all the participants were labelled as lower or higher WTC according to the results of their First WTC questionnaire (Step 0). More concretely, participants who had all their initial WTC precursors (*confidence*, *anxiety* and *desire*) better than average scores were labelled as higher WTC, while the others were categorized as lower WTC. Table 3 shows the resulting distribution of participants according to their WTC level in each of the 6 groups.

Table 3 Distribution of participants according to their WTC level.

	G1	G2	G3	G4	G5	G6
Lower WTC	6	4	6	6	5	5
Higher WTC	4	6	4	4	5	5

Table 4 Participants' preferences in Group 1 and 3 according to their WTC level.

	Lower WTC	Higher WTC
CS	1	4
CS+AB	11	4

Table 5 Participants' preferences in groups 2 and 4 according to their WTC level.

	Lower WTC	Higher WTC
AB	3	1
CS+AB	7	9

Table 6 Participants' preferences in groups 5 and 6 according to their WTC level.

	Lower WTC	Higher WTC
AB	8	2
CS	2	8

Table 4 shows the results of the System preference survey for participants of Groups 1 and 3 who all interacted with both the CS and CS+AB versions of the system. A square chi-test for independence was conducted indicating a relationship between learners' WTC level and their preference for CS or CS+AB ($\chi^2=4.44, p=.03$), with a medium (Cramer's $V=.47$) effect size according to Cohen's conventions for Cramer's V [20].

Table 5 shows the results of the System preference survey for participants of Groups 2 and 4 who all interacted with both the AB and CS+AB versions of the system. A square chi-test for independence was conducted indicating a relationship between learners' WTC level and their preference for AB or CS+AB ($\chi^2=5.00, p=.02$), with a medium (Cramer's $V=.5$) effect size.

Table 6 shows the results for System preference survey of the participants of Groups 5 and 6 who all interacted with both the AB and CS versions of the system. A square chi-test for independence was conducted confirming a relationship between learners' WTC level and their preference for AB or CS ($\chi^2=7.20, p=.05$), with a medium (Cramer's $V=.6$) effect size.

In sum, these results indicate that participants' preferences tendencies of system versions are likely to be

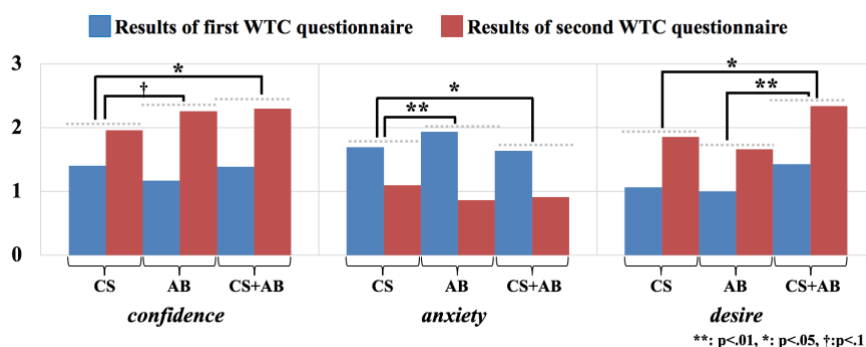


Figure 2 WTC outcomes for lower WTC participants.

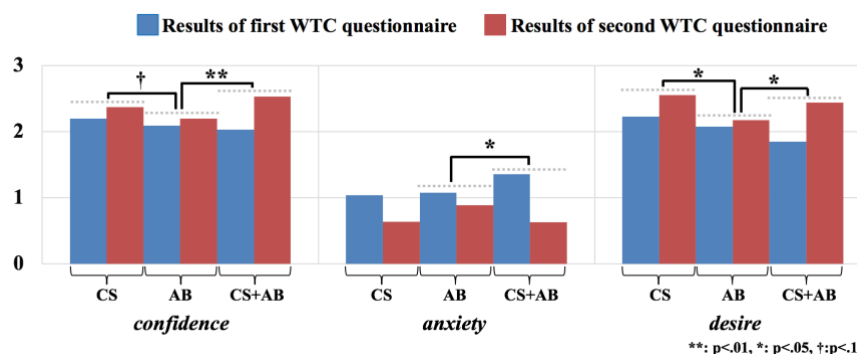


Figure 3 WTC outcomes for higher WTC participants.

different for lower WTC participants and higher WTC participants.

Learners' WTC level and WTC outcomes

In order to investigate whether and how WTC outcomes vary according to learners' differences, we analyzed differences among lower and higher learners' WTC results after interactions with the three versions of the system. To that extent, one-way ANCOVA was conducted to determine whether there were statistically significant differences between WTC posttest results whilst controlling for pretest results. Post-hoc Tukey Kramer tests were additionally run to further investigate the differences.

There was a significant difference in lower WTC participants' expected *confidence* [$F(2,28)=3.55, p<.05$], *anxiety* [$F(2,28)=3.40, p<.05$] and *desire* [$F(2,28)=3.39, p<.05$] among the three versions (i.e., CS, AB and CS+AB). The post-hoc Tukey Kramer tests showed that expected *confidence* of lower WTC participants who interacted with the CS+AB and AB versions was higher than for those who used the CS version; ($p=.04$, Cohen's $d=1.11$) for CS+AB vs CS, and ($p=.06$, Cohen's $d=1.00$) for AB vs CS, respectively. In addition, in terms of expected *anxiety*, results of lower WTC participants who

interacted with the CS+AB and AB versions were better than those who interacted with the CS version; ($p=.006$, Cohen's $d=1.43$) for CS+AB vs CS, and ($p=.04$, Cohen's $d=1.10$) for AB vs CS, respectively. Finally, in terms of expected *desire*, results of lower WTC participants who interacted with the CS+AB version were better than those who used the CS version ($p=.006$, Cohen's $d=1.43$) and AB version ($p=.006$, Cohen's $d=1.43$).

These results indicate that as far as lower WTC participants are concerned, the CS+AB and AB versions are in most cases more effective than the CS version in enhancing their WTC, as shown in Figure 2.

Regarding higher WTC participants, the one-way ANCOVA tests revealed that there was a significant difference in their expected *confidence* [$F(2,24)=3.48, p<.05$], *desire* [$F(2,24)=4.97, p<.05$], and a trend towards significant difference for *anxiety* [$F(2,24)=2.88, p<.1$]. The post-hoc Tukey Kramer tests showed that expected *confidence* of higher WTC participants who interacted with the CS+AB and CS versions was higher than for those who used the AB version; ($p=.004$, Cohen's $d=1.63$) for CS+AB vs AB, and ($p=.09$, Cohen's $d=1.04$) for CS vs AB, respectively. In addition, in terms of expected *anxiety*, results of participants who interacted with the CS+AB

were significantly better than those who interacted the AB version ($p=.01$, Cohen's $d=1.40$). Finally, in terms of expected *desire*, results of lower WTC participants who interacted with the CS+AB version and CS versions were better than those who interacted with the AB version; ($p=.03$, Cohen's $d=1.28$) for CS+AB vs AB, and ($p=.04$, Cohen's $d=1.19$) for CS vs AB, respectively.

These results suggest that as far as higher WTC participants are concerned, the CS+AB and CS versions are in most cases more effective than the AB version in enhancing learners' WTC, as shown in Figure 3.

To sum up, the analysis of WTC outcomes with respect to participants' WTC level suggests that the effectiveness of the different system versions tend to vary accordingly with participants' initial WTC level: CS+AB and AB versions seem to work better for lower WTC participants, while for higher WTC participants, the most effective system versions seem to be the CS+AB and CS versions.

4.5. Discussion and limitations

The above described results allow us to draw a number of preliminary conclusions.

Firstly, as far as the first research question related differences in learners' preference of employed strategies is concerned, we found that learners' perception of the system support, through the usage of CS and or AB, tends to vary according to the stage of development of their WTC (i.e., WTC level). Although the combination of both strategies (i.e., CS+AB) is the most preferred by learners, we observed that lower WTC learners tend to prefer AB over CS, whereas higher WTC learners on contrary, tend to like CS over AB. This is quite interesting since it suggests that depending on learners' WTC level, the reason sustaining their preference of the CS+AB version might not be quite the same among them.

Secondly, as far as the question related to variations in WTC outcomes with respect to learners' differences is concerned, we found that the effectiveness of CS or and AB toward increasing WTC is related to learners' WTC level, and consequently to their preferences. The CS+AB and CS versions tend to work better for higher WTC learners, while lower WTC learners tend to benefit more from their interactions with the CS+AB and AB versions. In other words, learners' preferred versions and effective system versions towards enhancing their WTC tend to be coherent, both for lower and Higher WTC learners.

Together, these results indicate that, not only learners' preferences of system versions vary according to the stage of development of their WTC, but also and more importantly, such learners' preferences tendencies tend to

be in line with the effectiveness of the system in enhancing their WTC. This further implies that it would be reasonable to achieve a more tailored WTC support to L2 learners by accounting for differences in their preferences.

All this begs the broader question of how to concretely achieve such L2 learner-tailored WTC support (i.e., third research question). From the results above, we assume that a more balanced usage of the combination of CS and AB may be beneficial for L2 learners. For example, lower WTC learners (i.e., who tend to prefer AB over CS) could be presented with a CS+AB version where AB are more frequently triggered than CS, while for higher WTC learners (i.e., who tend to prefer CS over AB), a version of the system where CS are more frequently used than AB may be employed. In such way, a learners' preferences aware dialogue management could be implemented so that as the learner's WTC grow, the dialogue agent could make usage of an adapted balance of conversational strategies that corresponds to each learner's preference.

As evoked in previous works [10][14], the key to make personalization in language learning a practical possibility could be the usage of technology, since practical constraints limit the extent to which learners' individual preferences can be accommodated in traditional classroom settings. We feel that the present work is in line with such view in the sense that our study gives hints on the feasibility to provide language learners with a computer-based language support that could account for their preferences.

Nevertheless, we are aware that mid-long term empirical investigations would be necessary in order to draw firm conclusions on the practical impact of such approach on L2 learners' WTC; the lack of such aspect at the current stage of our work can be viewed as a limitation. Furthermore, although even a very small amount of personalization may have significant positive effects on learners [10], we acknowledge that higher degree of personalization of our system might be more beneficial for learners, especially in a long term perspective. This could be achieved by accounting for learners' previous interactions in the dialogue management, as well as devising a method to automatically and continuously estimate learners' WTC level from interactions data in order to balance accordingly the usage of conversational strategies.

5. Conclusion and Future Works

The focus of adaptive language learning systems has been mostly on leveraging the technology to support

learners' knowledge of language rather than supporting communicative and motivational aspects of language learning with respect to learners' differences.

In this paper, we have investigated differences in learners' preferences of conversational strategies used by a dialogue agent dedicated to enhance their motivation towards communication. We have found that, not only learners' preferences tend to vary according to their WTC level but also, preferred strategies by learners tend to be the most efficient ones towards increasing their WTC. Such findings hint on the feasibility and meaningfulness to account for L2 learners' preferences in enhancing their WTC.

Directions for future works include redesigning the firing balance of CS and AB by conversational agents according to learners' preferences, and carrying out additional evaluations based on the findings of this paper. We will also explore the feasibility to achieve a higher degree of personalization in the WTC-support by accounting for learners' previous interactions data, as well as their current WTC level in the dialogue management. Our hope is that this work will contribute to raise interest on the continued development, evaluation and integration of personalized language learning support systems in traditional classroom settings.

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