Can you guess who I am?: An interactive task for young learners to practice *yes/no* question formation in English

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Abstract

Although *yes/no* questions are one of the most frequently occurring question types in English, research on the development and production of *yes/no* questions–in particular in young English learners–is still very limited. For example, we know very little about potential errors young L2 learners make when they produce *yes/no* questions–an area that is crucial in order to provide useful feedback in different learning environments, including computer-based applications. This paper reports on an exploratory study conducted with *Can you guess who I am?*, an interactive, spoken-dialogue-based speaking activity that allows young English learners to practice *yes/no* questions. After introducing the SDS-based speaking activity, we present the findings from a systematic investigation of the output produced by 27 young English learners in Germany (ages 9-11) who engaged with the activity. A particular focus in the analysis was placed on the types of *yes/no* questions elicited and the types of errors made by the young learners. The findings provide further empirical support for a six-stage framework for the development of question formation in L2 learners [14]. Moreover, they offer insights into the types of errors young EFL learners make in forming polar interrogatives such as systematic confusion with regard to the auxiliaries "to be" and "to do". The findings are discussed in terms of (a) how they contribute to a more comprehensive understanding of young learner's speech and (b) how they will be used to inform further development of more targeted feedback options that can be implemented into the SDS-based speaking activity in order to harness its full potential for L2 learning.

Index Terms: spoken dialog systems, language learning, question formation, *yes/no* questions, computer assisted language learning

1. Introduction

While research has provided ample evidence that interaction in a target language is conducive to second/foreign language (L2) learning (e.g., [1]), interaction research in recent years has shifted from a focus on instructional effectiveness to a focus on how interaction works [2]. While much of this type of research has focused on classroom-based interaction [3], an increasingly growing area of research has focused on how interaction works in computer-mediated learning environments among adult L2 learners (e.g., [4], [5]). In addition, several research studies in the field of computer assisted language learning (CALL) have investigated patterns of language use in interactions between L2 learners and automated agents through the use of spoken dialog systems (SDS); most of these studies have focused on adults (e.g., [6], [7]), but some have also investigated young L2 learners (e.g., [8], [8]).

In this study, we report on one aspect of a large research project that aims to investigate how young English as a foreign language (EFL) learners interact with SDS-based speaking tasks that are designed to help them practice specific grammatical phenomena in English. In particular, this paper reports on an exploratory study conducted with the *Can you guess who I am?* activity, an interactive SDS-based speaking activity that allows EFL learners to practice one of the most frequently occurring question types in English: *yes/no* questions [9, 10].

2. Background

2.1. Related Work

The English language distinguishes between two types of interrogative clauses: wh-questions or content questions and *yes/no* questions (also known as polar questions). While wh-questions typically require a more elaborate response, polar questions constitute requests for information that require a simple *yes/no* response (e.g., see [11] for a detailed overview). In English, *yes/no* questions are prototypically expressed with a combination of intonation and subject-auxiliary inversion in which the auxiliary verb *to be* is placed before the subject, e.g., ***She is** wearing a shirt. / **Is she** wearing a shirt?*. The same is the case for copular constructions with the verb *to be*, e.g., ***It is** Alison. / **Is it** Alison?* However, if the declarative predicate is headed by a lexical verb, that is, if the sentence does not contain an auxiliary verb, then the auxiliary verb *to do* must be inserted before the subject, which is then followed by the infinitive, e.g., ***She has** blond hair. / **Does she have** blond hair?*. Hence, unlike all of the other Germanic languages, English requires the insertion of what [11] calls a "dummy auxiliary" in order to form a grammatically correct interrogative (p. 24). Although research in the area of *yes/no* question formation in English is still very limited, studies have found certain patterns in the development of L2 learner speech with regard to polar interrogatives [12, 13, 14]. As shown in Table 1 below, [14], for instance, six stages have been proposed to describe the development of L2 learners' ability to produce questions.

Accordingly, L2 learners in the first stage of development will typically ask questions by applying rising intonation to words or phrases (e.g., *Keys?*). In the second stage of development questions are usually characterized by the same rising intonation, however it is applied to subject-verb-object clauses (e.g., *You have keys?*). At the third stage, L2 learners tend to begin fronting the question with a question element such as wh-word or the auxiliary *do* (e.g., *Do the key is in the box?*). At the fourth stage, learners begin to use inversion, forming *yes/no* questions with auxiliaries other than *do* (e.g., *Have he a yellow shirt?*). At the fifth stage, inversion becomes more target-like and learners also tend to place the auxiliary in second position

Stage	Question Types	Examples	Description
6	Cancel inversion	*I wonder where he was back then.*	Learners acquire the correct word order in indirect questions.
5	2nd (AUX and *to do*)	*Where can we go?, What did he do?*	Learners place the auxiliary verb (*to do* or another type) at the second position in direct questions. They also overgeneralize this structure to indirect questions.
4	Inversion (yes/no, copula)	*Have she watched it?, Where are my shoes?, Is he at home?*	Learners use inversion to form yes-no questions and wh-questions.
3	Do-fronting, Wh-fronting	*Do you hear me?, What he want?*	Learners form questions by fronting a constituent before the subject, verb and complement.
2	Rising intonation + subject verb-object (SVO)	*You want pizza?*	Learners use rising intonation for complete SVO structures as the main resource to form questions.
1	Single words or chunks	*Yes?*	Learners ask questions by adding rising intonation to single words or chunks.

Table 1: *Pienemann et al.'s (1988) six-stage framework for the development of question formation in L2 learners (adopted from [15])*

in direct questions while at times also overgeneralizing this to indirect questions. Overall, the six-stage framework has provided a reference point for a number of studies that have examined L2 question formation (for more detailed overviews see e.g., [15, 16, 17, 18, 19, 20]), finding, as [18] observed, the sequence of development in L2 question formation similar to that observed in studies of L1 development.

While most L1 research on question formation has focused on wh-questions, studies looking at *yes/no* questions in the L1 development of English speaking children found frequent subject-auxiliary verb inversion errors, auxiliary omission errors, and double tensing errors [21, 22, 23, 24]. Although research that has investigated *yes-no* questions in young L2 learner speech is very limited, researchers have argued that the morpho-syntactic constructions with the auxiliaries *be* and *do* pose specific challenges for young EFL learners [12, 13]. In order to help learners acquire these potentially challenging constructions, researchers and instructors have highlighted the positive effects of games on practicing grammatical structures such as those involved in forming *yes/no* questions in the target language [25, 12].

To summarize, research on the development of *yes/no* questions—in particular in young EFL learner speech–is still very limited. While the six-stage development proposed by [14] as well as research into the development and production of polar question formation in L1 learners may provide some preliminary insights, we still know very little about potential errors made by young EFL learners when producing *yes/no* questions—an area that is crucial in order to provide useful feedback in different learning environments, including computer-based applications. This study intends to respond to this gap by taking a closer look at *yes/no* questions that were elicited from young EFL learners who engaged with a game-based, interactive speaking activity.

2.2. Description of the Activity

The spoken dialog activity used in this study was designed to provide English learners an opportunity to practice a specific grammatical structure (*yes/no* questions) in the context of a goal-oriented information gap activity, referred to as the *Can you guess who I am?* activity in this study. Specifically, the learner is presented with a set of eight pictures of animated characters (including the head and shoulders), such as in Figure 1.
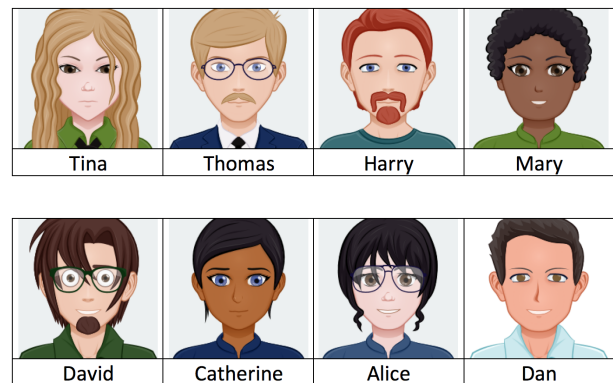

Figure 1: *Image of eight animated characters presented to language learners in the Can you guess who I am? activity*

The system then presents the learner with the following prompt to start the conversation:

> Let's play a game. I am one of these people. Can you guess who I am? Look at the pictures and ask *yes/no* questions to find out which person I am. For example, you can ask "Do you have red hair?" or "Are you wearing a green t-shirt?" Okay lets get started.

After each question provided by the learner, the system processes the learner's utterance in real-time using ASR and keyword matching to determine whether the answer to the learner's question is true or false based on the character that had been selected randomly by the system at the beginning of the conversation. The system then provides an appropriate answer to the learner's question and the conversation continues until the learner correctly guesses the name of the character. Sample conversations elicited by the activity are provided below in Tables 2 and 3.

In addition to answering the learner's *yes/no* questions, the system interlocutor can also provide feedback to the learner about the grammatical accuracy of the *yes/no* questions. Specifically, regular expressions were implemented in the natural language understanding module of the SDS to detect whether the learner's utterance used the expected subject-auxiliary inver-

sion; if not, a corrective feedback was optionally provided to the learner, such as *I'm sorry, I didn't understand that. Yes/no questions in English start with a helping verb followed by the subject, such as "Are you wearing a hat?"*. The *Can you guess who I am?* interactive activity was developed in HALEF, an open-source, modular, web-based framework for designing and deploying SDS tasks [26].[1]

3. Research Questions

The goal of this study was twofold: (a) to explore how young EFL learners interact with the activity and (b) to obtain first insights into their perceptions regarding the activity itself as well as the feedback implemented in the activity. In order to investigate these two aspects, the following research questions were considered:

1. How many turns does it take the young learners to complete the activity?

2. What grammatical structures do the young learners use to form *yes/no* questions?

3. What types of errors do they make?

4. What do they think about the activity?

4. Methodology

4.1. Participants

Overall, 27 young German EFL learners (13 males and 14 females) participated in this study. The students were between 9 and 11 years of age. Out of the 27 participants, 9 were students at a bilingual elementary school (4th grade *Grundschule*) and 18 were students attending the bilingual track of a middle school (6th grade *Gymnasium*) in Germany. Both, the elementary and the middle school English teachers indicated that their students' English proficency was approximately at the A2 level on the Common European Framework of Reference.

4.2. Data Collection Procedure

Data were collected at two schools in Germany, an elementary school (*Grundschule*) and a middle school (*Gymnasium*; lower secondary level) in September 2017. One of the researchers met with each student in the school's computer lab where the learner first engaged with the speaking activity before responding to a number of questions aimed at eliciting user perceptions and feedback. In order to create a low-anxiety environment for the young learners, the researcher informed the participants that this study was a development effort. That is, students were told that they were not being assessed, but that they were helping to teach the computer how to listen and respond to a human interlocutor in order to ultimately build a system that would allow children around the world to practice speaking English by using a computer. On average, students interacted with this task for approximately three minutes. While engaging with the task, students saw a graphic with the characters on the screen (see Figure 1 above). The semi-structured post-task interviews lasted about 5 minutes and were conducted in German, the students' first language. Post-task interview protocols focused on the students' perceptions of the *Can you guess who I am?* activity. The interactions with the speaking activity and the interviews that were

conducted orally by the researcher were audio-recorded. The researcher was seated next to the learner while the learner completed the activity to ensure students understood the directions and to provide technology support, if necessary.

4.3. Analyses

In order to investigate interaction patterns and user perceptions, task interaction and interview data were analyzed by means of different qualitative and quantitative approaches. First, the audio data, both for task interaction and interview responses, were transcribed verbatim. For the task responses, frequency counts were tabulated to obtain the number of turns, the types of questions asked, and the types of errors made by the young EFL learners. In addition, examples of the question types and errors were extracted from the transcripts. With regard to the interviews, frequency distributions were calculated for each survey item to determine consensus or discrepancy in opinions among participants. Open-ended responses were analyzed for major themes, before frequency counts of major themes were then tallied. For example, the number of students that mentioned that they liked the game-based nature of the activity or the pictures included in the task was counted. It is important to point out that the non-occurrence of a specific category (e.g., a learner did not mention the pictures) does not necessarily indicate that the aspect was not noticed by that student. Finally, representative responses were extracted as a means of capturing and documenting response patterns in the words of the young learners.

5. Findings

5.1. Task interaction

While all 27 learners engaged with the task, only 9 learners completed the game successfully insofar as they were able to complete the game by guessing the correct character.[2] It took these nine learners on average seven turns to complete the activity, that is, they asked on average seven *yes/no* questions (ranging from 3 to 10 turns total with a median of 7) before guessing the correct person. To showcase differences in the number of turns, the following two examples feature two participants that completed the task in three and seven turns, respectively.

The interaction featured in Table 2 shows that ID21 was able to strategically exclude characters based on his questions, targeting the presence of specific features such as glasses and the color of the character's outfit. His questions were grammatically correct. As a result, ID21 only received feedback with regard to content accuracy, that is, whether the character was wearing glasses and a green shirt. By contrast, the interaction presented in Table 3 is slightly more elaborate. ID18's first two questions were grammatically incorrect (*Have you* + direct object), omitting the auxiliary verb *do*. Thus, she received metalinguistic feedback from the system, prompting her to rephrase the question by using an auxiliary verb. After the second feedback prompt, she was able to correct her question and form the grammatically correct utterance in turn 3 *Do you have red hair?*.

Across all 27 participants, 157 turns (i.e., utterances) were complete, unique, intelligible, and uninterrupted.[3] Each ut-

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[1]A sample of the *Can you guess who I am?* activity is available at the following website: `https://videotelephony.halef-research.ets.org/dev/guessing_game.html`.

[2]Given the population of young EFL speakers which was completely new to HALEF, the system's ASR functionality was still limited (e.g., the word-error rate was 44% for 157 utterances). In order to limit the amount of frustration for the young EFL participants, the facilitator ended the task before it became too frustrating (e.g., in cases with very long latency).

[3]Although a total of 212 utterances were observed, 55 utterances

Interlocutor	Utterance
System:	*What would you like to ask?*
Learner:	*Do you have glasses?*
System:	*Yes, that's right. What would you like to ask?*
Learner:	*Do you have a green shirt?*
System:	*Yes, that's right. What would you like to ask?*
Learner:	*Are you David?*
System:	*Yay, good job! You have guessed who I am.*

Table 2: *Sample dialogue, participant ID21, male*

Interlocutor	Utterance
System:	*What would you like to ask?*
Learner:	*Have you a green t-shirt?*
System:	*I'm not sure I understand. Yes/no questions in English start with an auxiliary verb or helping verb followed by the subject. Something like "are you wearing a hat?" Try again! What would you like to ask?*
Learner:	*Have you red hair?*
System:	*I'm not sure I understand ... What would you like to ask?*
Learner:	*Do you have red hair?*
System:	*No, guess again. What would you like to ask?*
Learner:	*Do you have a green t-shirt?*
System:	*Yes, that's right. What would you like to ask?*
Learner:	*Do you have blond hair?*
System:	*No, guess again. What would you like to ask?*
Learner:	*Do you have black hair?*
System:	*No, guess again. What would you like to ask?*
Learner:	*Are you David?*
System:	*Yay, good job! You have guessed who I am.*

Table 3: *Sample dialogue, participant ID18, female*

terance contained a question of which 129 (i.e., 82.1%) were grammatically correct, while 28 utterances (i.e., 17.8%) contained errors. As shown in Table 4 below, participants used all three types of subject-AUX inversion discussed above when formulating yes/no interrogatives. Additionally, we observed two instances in which learners applied rising intonation to an SVO clause.

Out of the 28 grammatically incorrect utterances, errors were primarily related to two areas: the use of the auxiliary verb *do* (+ inversion) and subject-verb agreement. As shown in Table 5, the majority of errors were due to what we have labeled "AUX confusion" (32.1%), that is, instances in which learners seem to be aware of the required inversion, but struggle with identifying the correct auxiliary verb. The second most common error type concerns the omission of the auxiliary verb *do*—an issue that may be explained either by L1 transfer or the semantic function of *have* which, as a lexical verb, expresses possession.

were excluded from the analyses given that they were unintelligible (2.8%), incomplete (4.7%; i.e., when the system interrupted the speaker), non-speech (6.1%; i.e., instances where the participant did not say anything), and duplicates (12.2%, i.e., the user repeated the same question consecutively due to ASR issues).

Question formation	Structure	Frequency
Subject-AUX inversion, *to do*	*Do you have __?*	51.9% (67)
	Did you have __?	3.9% (5)
Subject-AUX inversion, copula	*Are you __?*	28.7% (37)
Subject-AUX inversion, *to be*	*Are you wearing __?*	14.0% (18)
SVO + rising intonation	S + V + O ?	1.6% (2)

Table 4: *Grammatically correct question types (N=129)*

Error type	Structure	Frequency
AUX confusion	*Are you have __?*	25% (7)
	Do you wearing __?	7.1% (2)
Omission of AUX (*to do*)	*Have you __?*	25% (7)
AUX overgeneralization (*to do*)	*Do you are __?*	17.9% (5)
Omission of AUX (*to do*) + S-V agreement	*Has you __?*	10.7% (3)
S-V agreement	*Is you __ ...?*	10.7% (3)
Verb omission	*Do you __?*	3.6% (1)

Table 5: *Grammatically incorrect question types (N=28)*

5.2. Student Perceptions

Out of all 27 participants, 26 indicated that they liked the speaking activity. While some students simply summarized their experience at a high level such as *"War cool!"* (*"Was cool!"*, ID23) or *"Macht einfach Spass!"* (*"It's just fun!"*, ID04), others were more explicit in identifying what they liked and/or disliked about the speaking task. Table 6 presents the most commonly identified features that learners highlighted as either positive or negative.

	Aspects	N
Positive	Guessing game	51.9% (14)
	Practicing questions in English	29.6% (8)
	Pictures and characters	22.2% (6)
	It's fun.	14.8% (4)
Negative	Automatic speech recognition	48.2% (13)
	Long metalinguistic feedback	14.8% (4)

Table 6: *Positive and negative student perceptions*

Overall, the interviews revealed quite positive views about the activity *Can you guess who I am?*. The majority of both elementary and middle school students very much appreciated the game-based approach to practicing question formation in English. For example, ID12 stressed that he thought it was *"Richtig toll, dass man so oft Fragen stellen kann, wie man will"* (*"Really great that you can ask as many questions as you like"*). Similarly, a middle school student argued that this is *"das coolste Spiel, weil man fragen muss, wie man aussieht und es macht viel Spass"* (*"the coolest game because you have to ask how someone looks like and it is a lot of fun"*, ID10). Highlighting the game-based approach, participant ID03, a pri-

mary level learner, enjoyed *"dass das ein Spiel ist und nicht so Wissen abfragt"* (*that it is a game and doesn't just test your knowledge*). Similarly, over 20 of participants highlighted the pictures and depiction of the characters as a positive feature of the activity. Also, some participants commented positively about the number of characters and their names: *"Die Anzahl der Personen und Namen sind gut."* (*"The number of people and names is good."*, ID07); *"überschaubare Anzahl"* (*"manageable number"*, ID11).

With regard to improvements, 13 learners explicitly commented that they had moments of frustration during the activity due to issues with the automatic speech recognition (ASR). Although "only" 48% of the participants mentioned ASR issues, it may very well be the case that more than 13 users experienced frustration but that they did not verbalize that perception given that the study was framed as "teaching the computer how to converse." The following student comments underscore the ASR issues:

- *"Dass der Computer nicht verstanden hat, was ich sage."* (*"that the computer didn't understand what I said"*, ID01)

- *"hat Spass gemacht, wenn es funktioniert hat"* (*"it was fun as long as it worked"*, ID03)

- *"Es ware 'ne coole Übung, wenn man das System verbessern würde."* (*"it was a cool activity if you could only improve the system"*, ID05)

Given that the data collected will serve to train the system and refine the ASR, future research and development will need to focus in particular on providing a smooth user experience in order to maintain interest and engagement during game-play, both crucial aspects for learning [27].

In addition to ASR challenges, participants had mixed experiences with regard to the metalinguistic feedback implemented in the activity. While participant ID18 (see Table 3 above) commented that the meta-linguistic feedback had functioned for her as a scaffold, helping her to eventually provide the grammatically correct question, several young learners were not as positive. For instance, participant ID10 noted that the feedback was *"zu lang"* (*"too long"*, while others such as ID23 stated that they did not understand the term "auxiliary verb" which rendered the feedback useless for them. However, even though they may not have understood the meta-linguistic terminology, several learners argued that they regarded more elaborate, metalinguistic feedback as more helpful (e.g., ID02; ID25).

6. Discussion

Overall, the *Can you guess who I am?* activity seemed to be able to provide a useful context for students to speak English and practice *yes/no* questions. As shown in the analyses, it took a learner on average seven turns to complete the activity, which suggests that engaging with the activity provides a good opportunity to practice and produce oral output in English. Given that in a regular EFL classroom in Germany students' overall speaking time has been found to be somewhat limited [28], computer-based activities like *Can you guess who I am?* may offer teachers an opportunity to increase their students' time to practice and produce oral output in the target language—something that seems to also be welcomed by the young learners themselves as elucidated by the comment of participant ID12 who very much appreciated *"dass man so oft Fragen stellen kann, wie*

man will" (*"really great that you can ask questions as much and often as you want to"*). Given that the target character that is to be guessed changes randomly with every iteration of game play, learners can also engage with the activity multiple times.

Moreover, the data showed that the activity elicited a broad range of grammatically correct *yes/no* question types, featuring subject-auxiliary inversion with the helping verbs *to do* and *to be* as well as copular constructions. Although we had anticipated most *yes/no* question types in the task design process, we had neither predicted a particular copular construction (*Is your hair red?*) nor SVO + rising intonation, a form that tends to be used predominantly by lower proficiency level learners [14]. The collected data helped provide a more comprehensive representation of *yes/no* questions produced by young EFL learners that will inform future development, in particular the implementation of more targeted feedback. For example, when detecting an "SVO + rising intonation" question, feedback which highlights "*do*-fronting" could be provided to guide learners towards the next stage in their *yes/no* question development [14].

Although most learners seem to be aware of the inversion required in the formation of English *yes/no* questions (4), morpho-syntactic constructions with the auxiliary verbs be and do still seemed to pose specific challenges for young EFL learners—a finding that is in line with observations made in earlier research (e.g., [12, 13]). As shown in in Table 5, more than 32% of all error types seemed to stem from confusion with regard to the two auxiliary verbs *be* and *do*. That is to say, learners appeared to be aware of the required inversion, but they struggled with identifying the correct auxiliary which resulted in utterances such as *"Are you have black hair?"* (ID22). Not only do the error types shed light on the types of structural errors young German EFL learners tend to make, but the morpho-syntactic structures revealed in this analysis can also be used to implement more targeted feedback into this activity to not only provide a means of practicing, but to also help learners improve their ability to form grammatically correct *yes/no* questions in English.

Finally, users perceived the activity overall as very positive and useful for practicing English question formation. In particular, they found the game-based approach to be fun and the visual representation of the characters to be very engaging. The users also made some constructive suggestions for improving the activity, in particular with regard to the ASR and semantic understanding as well as feedback implementation. Although, as outlined above, they indicated the need to revise the lengthy metalinguistic feedback, they commented positively about the *"shorter feedback"* (i.e., *"Yes, that's right!"* and *"Guess again!"*) as encouraging and helpful *"so dass man weiss, dass es weitergeht und das Spiel nicht zuende ist"* (*"insofar as you know that you can continue and the game isn't over yet"*, ID5). In terms of language-oriented feedback, they suggested the inclusion of visual feedback such as sample questions on the screen that feature the correct morpho-syntactic construction (e.g., 15 learners indicated that they would prefer seeing feedback in addition to just hearing it)–a suggestion that we will take into account in a future revision of the activity.

7. Conclusion

In summary, this study introduces *Can you guess who I am?*, a game-oriented, SDS-based activity for young L2 learners to practice *yes/no* questions in English. Moreover, the research provides preliminary insights into the development and ability of young German EFL learners to produce *yes/no* questions in

English—an underexplored area in young L2 learner research. Although the data do not allow inferences with regard to developmental sequences—an area that needs to be addressed by future research—they underscore that the question types specified in [14] were also used by the young EFL learners Additionally, the findings provide insights into the types of errors young German EFL learners make in forming polar interrogatives. The findings also provide a more comprehensive understanding of young learner's interlanguage speech, thus informing and facilitating further development of more targeted feedback options that need to be implemented into the SDS-based speaking activity in order to harness its full potential for L2 learning.

As this study was a first exploration of the *yes/no* questions young learners produced when engaging with the *Can you guess who I am?* activity, several limitations need to be acknowledged. A particular caveat of this study was the low sample size. Subsequent research should investigate a larger, more heterogeneous sample that includes learners of different age groups in order to be able to study the potential impact of differences in cognitive development and/or L2 proficiency. Moreover, due to the challenge of obtaining accurate automatic speech recognition (ASR) and semantic understanding results for open-ended spontaneous speech produced by L2 speakers in general and young L2 learners in particular, the SDS system's accuracy in determining the appropriate next response was only 63.0%. Thus, future work will need to focus on improving the ASR and semantic understanding components in order to provide a better user experience–a critical aspect of the activity, especially for young learners who have been found to lose interest and motivation quickly when faced with repeated technology issues [29]. Hence, future research will need to investigate ways to refine the ASR, further adapting it to understand to young L2 learner speech, particularly focusing on the implementation of linguistic feedback and scaffolding tailored to the needs of the young L2 learners.

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