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Effects of required and optional exchange tasks in online language learning environments

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Abstract

This study investigates the effects of an optional and required (jigsaw) task on learners' quantity and quality of use of language under synchronous and asynchronous conditions. The question raised is: Does performing either of these task types under synchronous conditions cause a compounding effect that either positively or negatively impacts language production? Eighty-six beginning learners of German participated in this study. The results show that the optional task yielded significantly more learner output, both in terms of target language and c-unit counts. The impact of the condition appears to be mixed, favoring the synchronous mode. Regarding quality, students produced fewer errors when performing the required than the optional task. The results of this study have implications for task design and implementation in online learning environments.

Keywords: online language learning, computer mediated communication (CMC), task-based learning, synchronous/asynchronous interactions

1 Introduction

The use of text-based computer-mediated communication (CMC) such as email, bulletin boards, forms, blogs, wikis, instant messaging, chats, etc., has become part of many people's everyday existence. In computer-assisted language learning (CALL) the use of such tools and means of interaction touches at the heart of current task-based instruction as this use extends the use of language outside the classroom, providing additional opportunities for students to practice and interact in the target language. The question that arises is how can tasks be designed so they induce optimal language production? What are the factors that engage learners in conveying information? In addition, what are the optimal conditions that support this process?

The theoretical foundation of task-based teaching is based on the rationale that through tasks opportunities for practice can be afforded that emphasize using language, i.e. production, rather than learning about language. According to language learning theory, production plays an indispensable role in acquisition (see Ellis, 2003; Skehan, 1998; Swain, 1995). Skehan (1998) offers several arguments to support this claim. One argument is that production helps automatize existing L2 knowledge and that, furthermore, it provides opportunities for learners to develop discourse skills.

This argument is further supported by skill-learning models of language acquisition. According to Anderson (2000), language learning proceeds from declarative knowledge to a final procedural stage where knowledge is automatic. Proceduralization can only be achieved through extensive practice in using L2. A second argument is that production forces syntactic processing, that is, obliges learners to pay attention to grammar.

When people interact – and this is only obvious – the task itself and its goal play an important role, which needs to be taken into account when investigating what drives learners' language production. In task design, several factors have been proposed to encourage interaction and thus to be conducive to increasing language output. For example, some research suggests that tasks that require information exchange – as opposed to those making it optional – intensify negotiation and thus lead to greater language use. One particular strategy that is believed to lead to increase in information exchange is the jigsaw design (Blake, 2000; Keller-Lally, 2006; Pica, Kanagy & Falodun, 1993; Smith, 2003). In a jigsaw task, information is split among participants, where each participant holds different pieces, and all participants are required to contribute to fill in the gaps and achieve the targeted goal (see Pica, Kanagy & Falodun (1993) for a detailed description of different task classifications). Despite such suggested benefits, jigsaw tasks have also been reported to have negative effects. For example, Keller-Lally (2006) has observed that students often prematurely give up, in particular under synchronous conditions. Thus, rather than instigating interaction jigsaws may also achieve the opposite of the intended effect. In research, this side effect has largely been ignored. The question that arises is to what degree does a 'required' task have a driving effect on language use and when does it become counter-productive?

Cognitive theories that underline task-based instruction also emphasize the need for practice in the context of 'real operating' conditions in communication (Johnson, 1988), that is, they should be the same as real-life situations. In CMC, this makes the use of email or chat application ideal candidates for language learning purposes. In CMC, operating conditions are primarily determined by two different modes of communication, that is, whether students engage in synchronous or asynchronous interaction. Here a synchronous mode of communication is defined as an interaction that takes place at the same time, while being at different places (e.g. via chats), and asynchronous refers to an interaction that occurs at different places and at different times (e.g. via email).

Of course, exchanging information under synchronous or asynchronous conditions involves different processes, and arguments that favor or disfavor language production can be made respectively for each condition. On the one hand, a synchronous mode allows for immediate interaction. The immediacy of this mode makes it possible for students to ask and respond to each other with only limited time delay. In the case of miscomprehension or miscommunication, unsolved issues and questions can be addressed immediately. The immediacy aspect of this mode also brings the interactants much closer, and makes them feel more connected. As pointed out by Christophel (1990), for such reasons, interactants feel more motivated to engage. On the other hand, a synchronous mode may cause pressure for interactants to provide responses immediately and thus affect the information exchange in negative ways. Interactants may spend less time thinking about their answers and

thus feel inclined to respond in terse statements. This interaction is different under asynchronous conditions where users may feel less pressure and thus have more time to comprehend and produce language at their own pace and time (Kitade, 2006). The question that arises is to what degree does the condition play a compounding role impacting a learner's output? Given that tasks in CMC are either performed synchronously or asynchronously, what is the impact of either mode? Is it supporting or is it actually impeding?

The questions, whether and to what degree different task types and modes of interaction have a compounding effect have received no attention. By providing two different task types, a task with required information exchange (jigsaw) and a task where the amount of informational exchange was optional, we wanted to observe the effects of performing these tasks under synchronous and asynchronous conditions on beginning students' quantitative and qualitative language production.

2 Literature Review

In task-based research it is widely argued that engaging in communicative language tasks aids an L2 learner in several ways. As Foster (1998) points out "Tasks provide an opportunity not only to produce the target language, but also, through conversational adjustments, to manipulate and modify it" (op. cit.: 1). Task types are considered important, which explains why the questions 'what drives interactions and negotiations', and 'what task types generate optimal language output' have received considerable attention in classroom- and CMC-based research.

Drawing on the classification suggested by Pica, Kanagy & Falodun (1993), tasks can be distinguished according to whether there is a one- or two-way flow of information between interactants, or whether the information to be shared is held by one or many. Other distinguishing factors have to do with the source of the information that is to be exchanged, i.e., whether the information is based on learners' personal experience or opinions (e.g., opinion-based activities) or on an external source (e.g., information-based activities), whether the information is required or optional, and the goal that is to be completed (e.g., decision-making versus problem-solving tasks).

By and large, research suggests that tasks in which the information is split (e.g., jigsaws), and which subsequently make information exchange required, have the highest potential in promoting negotiation and also in generating increased output among participants (see Pica, Kanagy & Falodun, 1993). Ellis (2003) reports about a study conducted by Newton (1991) who investigated a medical task which in one of its formats required learners to first exchange information about four candidates for a heart transplant (a required information task) and then to use the information to determine who should get a heart transplant (optional informational exchange). Newton found almost twice the number of negotiations in tasks where the information provided was divided among learners compared to tasks where the information was shared.

Another study by Foster (1998) compared the language produced by intermediate EFL learners engaged in required and optional exchanges in dyads or small groups. Her results show no clear effects for task type although her findings suggest a trend for dyads performing two-way tasks to produce more negotiation.

The need for interaction is in general believed to be a factor that is conducive to enhancing language production. In CMC-based research, this belief has triggered numerous studies to investigate the interaction between technology and TBLT (task-based language teaching). In particular those task types whose design structures require interaction, e.g., information gaps, jigsaws and joint decision-making tasks, have received the most attention. This research in particular raises the questions whether and to what degree particular task features trigger interaction and what their effects on student behavior and language learning are.

For example, Blake (2000) asked 50 intermediate Spanish speakers in dyadic chats to carry out a series of jigsaw, information gap (one- and two-way), and decision-making tasks. His results show that jigsaw-type tasks triggered the most negotiations whereas information gap tasks were not nearly as productive as a stimulus. In another study Smith (2003) looked at how much learners negotiated for meaning when performing two different jigsaw and decision-making tasks. His results demonstrated that decision-making tasks yielded more negotiated turns than jigsaws. In a similar study, Keller-Lally (2006) investigated frequency of negotiations and also how much language in general intermediate students of German produced when using different task types. In her study she also compared opinion exchange tasks with decision-making and jigsaw tasks. Counting c-units, she found that learners produced more target language output in decision-making and opinion exchange tasks than in jigsaw tasks. In contrast to Blake (2000) and Smith (2003), however, she did not find any significant differences between decision-making and jigsaw tasks as far as number of negotiations are concerned.

In CMC the option also exists to interact either synchronously or asynchronously. In general, research on the effects of these modes has revealed that they impact both the type of discourse functions and the linguistic feature of language production in a quantitative and qualitative sense (Kitade, 2006; Lai & Li, 2011; Sotillo, 2000).

Sotillo (2000) investigated discourse functions obtained in advanced ESL learner output via synchronous and asynchronous discussions. Tasks involved synthesizing and analyzing information from a book of readings. The results showed that the quantity and types of discourse functions present in synchronous discussions were similar to the types of interactional modifications in face-to-face conversations. Learners produced many messages, many of which, however, were only very short.

In contrast, the asynchronous interactions were more constrained than those found in synchronous discussions and resembled the initiation-response-feedback discourse type. The quantity and types of interactional functions found in the synchronous mode of CMC were not present to the same extent in the asynchronous discussions.

Several studies have also investigated the amount of language production of learners during open discussions, i.e., when engaged in divergent tasks (Abrams, 2003; Hirotani, 2009). Abrams (2003) while comparing synchronous and asynchronous groups to a control group found that synchronous CMC (SCMC) students produced a higher number of communication-units and words than students in the asynchronous CMC (ACMC) mode.

Some research also looked at the effect of the modes on learners' quality of language. In general, research in this area claims that ACMC data are more accurate, complex and formal and longer than those in SCMC (Kitade, 2006; Sotillo, 2000). For example,

Sotillo (2000) has shown that asynchronous CMC students produce language that is syntactically more complex and of greater lexical richness. In particular, she reports that her students produced more subordinate and embedded subordinate clauses in the asynchronous mode than those participating in synchronous discussions.

When looking at accuracy, Sotillo (2000) further reports that students in synchronous discussions produced a higher rate of error-free text-units than those performing in asynchronous modes. In a similar and more recent study, Hirotani (2009) corroborated this finding**.** She concludes that these results may have occurred due to students using less language in general and also syntactically less complex language. Not all research in this area, however, has yielded unequivocally positive results. Studies by Lee (2001; 2002) had challenged the value of online communication for prompting linguistic accuracy. She found that learners tended to ignore each other's mistakes, focusing on the meaning of the communication rather than the form itself. Sotillo and Hirotani's findings contradict claims and observations (see Chun, 2008; Kitade, 2006) that learners' language production in general is of higher quality in ACMC, at least as far as accuracy is concerned.

Both modes of interaction have also been reported to produce some side effects. For example, Kitade (2006) investigated the negotiation structure and strategies of 24 native speaker–non native speaker (NS-NNS) dyads while discussing travel plans over a period of five weeks via e-mail. She concluded from her findings that "The time interval between the email messages had both a positive and negative effect on the L2-learning environment. While participants had sufficient time to comprehend, plan, and produce messages, the pressure to reply to signals was also reduced, and thus, the participants easily ignored or forgot them" (op. cit.: 337). In a study by Abrams (2003), whose students produced less language in the asynchronous mode, she attributed the difference to the fact that members in the asynchronous discussion groups were less motivated to participate due to the extended nature of the interactions in which learners often had to wait for several days for responses.

In contrast to asynchronous interactions, synchronous interactions have also been reported to yield some negative findings which some researchers have attributed to the fleeting nature of CMC exchanges. Early work by Beauvois (1992, 1995, 1998), which was later supported by Arnold (2002) claimed that learners who needed more time to think felt they were left behind in conversations by students who were faster typists, more fluent in the language and less concerned about the form of their language.

This synthesis of research suggests that in general asynchronous online communication seems to result in more complex language production and discourse whereas learners produce more language in synchronous environments; at the same time, the use of more complex language production seems to evoke higher rates of errors.

Research has also shown that specific task design factors account for differences in quantitative and qualitative language production. Ortega (2009) who conducted a comprehensive review of the research on the interaction of text-based CMC concluded that the frequency of negotiated interaction occurring during technology-mediated task performance depended largely on the design of the tasks. Drawing on research by Blake (2000) and Jepson (2005), she argues that free discussions lead to disappointingly low instances of negotiated interaction (cited in Lai & Li, 2011). However, what is not always clear is to what degree the discussion of different content also accounted for

differences in the outcome, given that in some studies (see Blake, 2000 and Keller-Lally, 2006) different topics were cited in the tasks used for comparisons. This is a factor, which if not held constant, may have caused a potentially confounding impact (Ellis, 2003). Moreover, the findings in the studies on the effects of task-based factors are inconsistent and the question arises whether there are other potential factors at play driving language production. Furthermore, the questions, whether and to what degree different task types and modes of interaction have a compounding effect have not been addressed and remain unexplored.

3 Rationale and research questions

No research exists that has compared the effects of required and optional exchange tasks in an online learning environment and thus that also takes into account potentially compounding effects created by a synchronous or asynchronous mode of interaction.

The present study was designed to answer the following research questions:

1. Does a task with a required information exchange lead to more language production than a task with optional information exchange? Here we hypothesize, following previous research findings, that a task with a required information exchange is more conducive to language production than one with an optional information exchange.
2. What are the effects of a required and optional information exchange task under a synchronous or asynchronous condition on the quantity and quality of language production? Here we hypothesize that a synchronous mode of interaction creates a complementary effect leading to more language output than an asynchronous mode. Furthermore, given that students have more time to reflect, their performance in the asynchronous environment will result in more accurate language than their performance in the synchronous mode.

4 Method

4.1 Participants

The participants in this study were 86 students in nine sections of beginning German (Germ 101) at the University of Washington, who performed interactive tasks in dyads online. The students had no prior background in German and ranged in age from 18 to 25. All students had general computer skills and were familiar with the chat and forum modules in Moodle.

Intact groups, i.e., entire sections were assigned to a synchronous or asynchronous group. The synchronous and asynchronous groups were further divided into optional or required task groups. The assignment to an intact group and the designation of partners was done randomly. For the latter, the automatic group assignment feature built into Moodle was used. Table 1 exhibits the group arrangements.

To guarantee that the learners were equally distributed across groups and to offset the possibility that learner ability skewed the outcomes, the students' course grades, based on their current standings were compared between groups. The students' grades were used as they comprise a wide range of different components including

Table 1 *Number of participants and group arrangements*

Tasks	*Synchronous*	*N*	*Asynchronous*	*N*
Optional	Group I:	14	Group III:	22
Required	Group II:	14	Group IV:	36

several written exams, structured and open-ended homework assignments, and thus were believed to represent a relatively objective measure that accounted for the participants' ability and motivation. Independent *t*-test comparisons that were performed between groups produced the following results: Group I ($n = 14$; $M = 95.78$, $SD = 4.9$) vs. Group II ($n = 14$; $M = 95.14$ ($SD = 2.9$)): $t(26) = 0.422$, $p = 0.7$ ($d = 0.4$). Group III ($n = 22$; $M = 96.18$, $SD = 4.35$) vs. Group IV ($n = 33$; $M = 94.85$, $SD = 5.48$): $t(53) = 0.95$, $p = 0.34$ ($d = 0.3$). None of the *p*-values were found significant. In addition, the estimates of effect sizes (Cohen's *d*) of the standard deviation units indicate a high degree of overlap. This means the degree of homogeneity of both groups was fairly high. The uneven group sizes resulted from the fact that not all students submitted their assignments. Subsequently, group homogeneity had to be established by including only those students who turned in their assignments.

4.2 Instrument

The instrument of this study consisted of two different task types. Task I was a communication gap activity with a required information exchange (see Appendix 1 for task description). The goal of this task was for two interactants to fill in missing information in a family tree chart. The targeted information asked about names of family members, their place of origin, profession and age of three different generations. This task constituted a jigsaw design as the information to be exchanged was split between two interactants.

Information about the family members was presented in the following form: On the students' handouts, some facts about the family members were stated directly in the family tree chart (e.g., the name of the grandfather). This means, some facts could be directly looked up in the chart. Other information was provided only indirectly in the form of verbal descriptions or clues. For example, one of the two interactants would be given information such as *Petra ist 40 Jahre alt und ihr Mann ist vier Jahre älter*. [Petra is 40 years old and her husband is four years older]. Respectively, her conversation partner was only given information about the name of Petra's husband, e.g. *Petra ist mit Rainer verheiratet*. [Peter is married to Rainer]. To find information about a family member, students had to engage in different strategies: They had to ask their conversation partner, or decipher clues from their verbal descriptions. Deciphering the clues involved determining family relationships (e.g., Petra… and her husband…) or calculating somebody's age (e.g., …her husband is four years older). By embedding information in the form of clues, as opposed to simply stating information, the purpose of this design was to initiate multiple interactions and thus maximize language output. This design element also included an element of

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cognitive complexity as students had to decipher family relationships and do simple math calculations.

This task was tested earlier with several native speakers and highly proficient non-native speakers of German and two sections of beginning German students in the previous quarter who were consistently able to accomplish the task. The average number of c-units that it took the NS-NNS dyads to achieve the task was 48. This number gave a point of reference for the number of c-units it would take to complete the task. The average number of target-language words was 228.

Task II constituted a communication gap activity with optional information exchange. The goal of this task was for the participants to elicit information about their families and draw up a chart of their family trees. The students were asked to exchange information about three family generations only, i.e., their grandparents, parents and their children, including their names, professions, and age, and where they live. The design parameters such as the topic, the goal and the scope of task II were kept as similar as possible to task I, in order to make the outcome of both tasks comparable. Task II distinguished itself from task I in one primary aspect. In task II, it was up to the participants to decide how much information they wanted to exchange in order to achieve the goal. In contrast, in task I, the information exchange was required and its content and outcome were predetermined.

4.3 Procedures

The study took place after approximately two thirds of the first period of instruction had been completed. The participants were assigned the tasks as homework assignments. The instructors for each section informed their students about their partner arrangements. To guarantee maximum student participation, the students received credit for completing the assignments. All students completed the assignments in their own time outside of regular scheduled class time. Students in the synchronous groups were individually responsible for arranging the time when they would meet with their chat partners. Originally the students were given a period of one week to fulfill the assignment. This period was extended to an additional week as students asked for more time to set up appointments with their chat partners. All participating students completed the 'required' information exchange task (jigsaw) or the 'optional' information exchange task either synchronously or asynchronously. For the synchronous mode the students used the chat module in Moodle, and for the asynchronous mode, they were asked to post their questions and answers to the forum**.** The log reports that were kept by Moodle provided the database for this study. Appendix 2 provides the task description for group I, the optional family tree task in the synchronous mode (chat room), and for group IV, the required tree exchange task (jigsaw) that was assigned to students to complete asynchronously in the forum.

5 Results

5.1 Analysis

To analyze the effects of the modes of environments and the task design factors on language production, the following data were collected. C-unit and target-language-word (TLW) counts were performed to account for the quantitative use of language.

C-units were defined as isolated phrases that are not necessarily accompanied by a verb, but have communicative value (Abrams, 2003) or those that include a syntactic main clause and its associated subordinate clauses (Chaudron, 1988)[1]. The rationale for using both c-units and a TLW count, was that language produced in chat rooms has been found to be similar to oral discourse, whereas the speech of students who exchange information asynchronously, e.g., via email, displays characteristics that are similar to conventional written discourse as far as length or completion of whole sentences and phrases are concerned. C-units that did not contain any information essential for fulfilling the task assignment were disregarded. Examples (in German) included "Hello", "Bye", "See you tomorrow."

To account for learners' qualitative language production, the number of grammar and spelling errors were tallied. Because students ultimately may ignore or pay less attention to spelling in chat environments, errors were clustered into two categories: (i) grammar errors (including morphological, lexical, syntactical errors, the use of a number of English words that were embedded in a German phrase (note that students had been instructed to use only German), and (ii) spelling errors. Repeated grammar and spelling errors were not counted. Grammar errors were recorded as percentage scores to account for learners' differences in the amount of language they produced[2]. The rationale for using percentage scores was based on several factors: First, the students were low-level beginners. Their ability to produce lexically and syntactically complex language was very limited. The nature of the written output produced in the forum responses as opposed to the output produced in the chat room was also very different, whereas the language produced in the chat room assimilated spoken discourse consisting of one-word responses, clauses that were often incomplete, and overall accounted for only few error-free clauses, making this measure very small. For that reason, using percentage scores, i.e., dividing the number of errors by the number of words used was believed to be a more sensitive measure accounting for the differences of the experimental conditions.

SPSS was used to perform two different analyses. In the first part, a two factor independent measures Analysis of Variance (ANOVA) was performed to see whether there was a main effect for the factors, mode (synchronous vs. asynchronous) and task design (optional vs. required), and a possible interaction between the two as indexed by the number of target language words (TLW) and c-units. The initial analysis showed that there was a large difference in standard deviations of the different groups for the TLW and c-unit counts. Subsequently, to stabilize the variance across groups, log transformations were conducted and used on the latter two sets of data. In the second part, independent t-tests were performed to further compare the effects within groups upon the number of target language words and c-units for those factors that showed significant differences. The effect sizes of standard deviation units were calculated using the effect size calculator at http://www.uccs.edu/~faculty/lbecker/.

[1] The following provides an example of a C-unit: "Wo wohnt Georg" = 1 C-unit; Seine Frau heißt Lisa. =1 C-unit.

[2] Two native speakers of German separately coded a sample of 1 data set taken from each group, then compared analyses and reached consensus. Subsequently, one rater scored and analyzed all the data for the C-unit and TLW count measures and for error ratio.

Table 2 *Gain scores on four measures: Results of Two-Way ANOVA*

Index	Source of variation	*Sum of Squares*	*df*	*Mean Square*	*F*	significance *of F*
TL Words	Mode	0.018	1	0.018	0.149	0.7
	Task	1.514	1	1.514	12.504	0.001
	Mode*Task	0.123	1	0.123	1.014	0.317
C-Units	Mode	0.464	1	0.464	4.072	0.05
	Task	0.795	1	0.795	6.973	0.01
	Mode*Task	0.096	1	0.096	0.838	0.363
Grammar Errors	Mode	26.962	1	26.962	3.058	0.084
	Task	146.747	1	146.747	16.644	0.001
	Mode*Task	1.234	1	1.234	0.14	0.7
Spelling Errors	Mode	49.08	1	49.08	12.502	0.001
	Task	0.312	1	0.312	0.08	0.779
	Mode*Task	0.298	1	0.298	0.076	0.784

5.2 Findings

5.2.1 Research questions. Is there a difference between the two different task types, that is, whether students perform a task with a required versus an optional information exchange? What are the effects of the mode, i.e., whether the task is performed under synchronous or asynchronous conditions upon quantity and accuracy of language production?

5.2.2 Results. Table 2 shows the results of the two-way ANOVAs for the measures of number of c-units and target language words. Here we were looking for significant main effects for two factors, task types and mode, and a possible interaction. The results show that for the factor task types, i.e., whether the participants performed a task with a required or optional information exchange, a significant main effect was found. This was the case when looking at the number of target language words, $F(1,81) = 12.504$, $p < .001$, and also c-units, $F(1,82) = 4.072$, $p < .05$.

For the factor mode, i.e., whether tasks were performed synchronously or asynchronously, there was no main effect for the measure of TLW, $F(1,81) = 0.149$, $p = .7$. However, the main effect for the measure of c-units was significant, $F(1,82) = 4.072$, $p < .05$. There was no significant interaction between the two factors, when looking at TLW, $F(1,81) = 1.014$, $p = .317$, and c-units, $F(1,82) = 0.838$, $p = .363$.

5.2.2.1 Effects of the mode upon quantity of language production. To further analyze the differences between the required and optional task groups and their effects on the number of c-units and TLW, mean comparisons were performed.

Table 3 provides a comparison of the mean scores of the effects of the optional withthe required task under the synchronous condition. The comparisons show that students who performed the 'optional' task (personal family tree) produced more words ($M = 189$, $SD = 80.24$; log transformations: $M = 5.15$, $SD = 0.44$) and also more c-units ($M = 43.6$, $SD = 19.7$; log transformations: $M = 3.8$, $SD = 0.41$) than the required-exchange

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Table 3 *Comparison of the effects of the optional (I) and the required task (II) under synchronous conditions upon quantity*

Variables	Groups	*N*	Mean	*SD*	Std. Error Mean	*t*	*df*	*p*-value	effect size (Cohen's *d*)
TL Words	I	14	5.15 (log) 189	0.44 (log) 80.24	0.11754 (log) 21.44556	2.548	26	0.017*	0.9 (large)
	II	14	4.79 (log) 125.6	0.31 (log) 41.14	0.08401 (log) 10.99631				
C-units	I	14	3.84 (log) 43.6	0.41 (log) 19.7	0.1098 (log) 5.28	2.089	26	0.047*	0.8 (large)
	II	14	3.56 (log) 32.7	0.29 (log) 9.2	0.0762 (log) 2.48				

*$p < .05$

task (jigsaw) (TLW: $M = 125.6$, $SD = 41.14$; log transformations: $M = 4.79$ $SD = 0.31$; C-units: 32.7, $SD = 9.2$; log transformations: $M = 3.56$, $SD = 0.29$). Both comparisons were significant ($p < .05$) showing large effect sizes (Cohen's d).

Table 4 shows the mean comparisons under the asynchronous condition. The results show that students who performed the optional task (personal family tree) also produced more words ($M = 168.27$, $SD = 73.26$; log transformations: $M = 5.04$, $SD = 0.42$) and more c-units ($M = 34.86$, $SD = 34.86$; log transformations: $M = 3.61$, $SD = 0.37$) than the required group task (jigsaw) (TLW: $M = 128.68$, $SD = 34.16$; log transformations: $M = 4.84$ $SD = 0.26$; c-units: 28.03, $SD = 8.88$; log transformations: $M = 3.48$, $SD = 0.3$). The comparison of the number of TLW was significant ($p < .05$), showing a large effect size ($d = 0.6$). The result for the C-unit comparison was not significant.

Since we had found a main effect for the factor mode regarding number of the c-units, we also performed mean comparisons between synchronous and asynchronous groups for this measure. None of these mean comparisons was found to be significant.

5.2.2.2 Effects of the mode upon accuracy. Further mean comparisons were conducted to see if there was a difference between the optional and required task groups regarding the effects upon grammar errors when performing under a synchronous or asynchronous condition. These results are shown in Table 5 and 6. The comparison shows that the required task group produced fewer errors ($M = 4.12$, $SD = 3.11$) than the optional task group ($M = 6.78$, $SD = 3.74$) under synchronous conditions (see Table 5). Although the p-value is at 0.06, the small group size and a large effect size ($d = 0.7$) suggest this difference to be significant (see Larson-Hall, 2010). Under an asynchronous condition (see Table 6) the results were similar. Here the required task group ($M = 2.74$, $SD =$ 2.29) also produced fewer errors than the optional task group ($M = 5.82$, $SD = 3.36$). The p-value was significant at $p < 0.001$. Cohen's d is estimated to be large, $d = 1.08$.

Since a significant difference (see Table 2) was only found for the factor mode when measuring the effects upon spelling errors, further mean comparisons were conducted between the synchronous and asynchronous groups to identify the difference. As shown in Table 7, the percentage of spelling errors was significantly lower under the asynchronous condition ($M = 1.62$, $SD = 1.7$) than under the synchronous condition ($M = 3.25$, $SD = 2.4$). Cohen's d is estimated to be large.

6 Discussion

The study investigated the effects of a required and an optional information exchange on learners' quantity and quality use of language. Furthermore, we also looked at the effects of the mode, i.e., whether performing such tasks under a synchronous or asynchronous condition further influenced language production. The results show that students who performed the task with optional information exchange produced more target language words and also c-units than those who performed the jigsaw task with a required information exchange, under synchronous conditions. Under asynchronous conditions, this was only the case when counting target language words. This finding is surprising and supports general claims that tasks with more open-ended and divergent solutions lead to more production of words than convergent tasks (Duff, 1986). The results further suggest that the synchronous mode has a

Table 4 *Comparison of the effects of the optional (III) and the required task (IV) under asynchronous condition upon quantity*

Variables	Groups	*N*	Mean	*SD*	Std. Error Mean	*t*	*df*	*p*-value	effect size (Cohen's *d*)
TL Words	III	22	5.04 (log) 168.27	0.42 (log) 73.26	0.08896 15.62	2.279	55	0.027*	0.6 (large)
	IV	35	4.84 (log) 128.68	0.26 (log) 34.16	0.04447 5.77				
C-units	III	22	3.61 (log) 34.86	0.37 (log) 34.86	0.07972 3.32	1.516	56	0.135	0.4 (medium)
	IV	36	3.48 (log) 28.03	0.30 (log) 8.88	0.05011 1.48				

*$p < .05$, **$p < .001$

Table 5 *Comparison of the effects of the optional (I) and the required task (II) in the* ***synchronous*** *environment upon grammar Errors*

Variables	Groups	*N*	Mean	*SD*	Std. Error Mean	*t*	*df*	*p-value*	effect size (Cohen's *d*)
Grammar Errors (%)	I	14	6.77	3.74	0.99905	1.969	26	0.06*	0.7 (large)*
	II	14	4.21	3.12	0.83374				

*$p < .05$

Table 6 *Comparison of the effects of the optional (III) and the required task (IV) in the* ***asynchronous*** *environment upon grammar Errors*

Variables	Groups	*N*	Mean	*SD*	Std. Error Mean	*t*	*df*	*p-value*	effect size (Cohen's *d*)
Grammar Errors (%)	III	22	5.82	3.36	0.71646	4.166	55	0.001**	1.08 (large)
	IV	35	2.74	2.29	0.37666				

*$p < .05$, **$p < .001$

Table 7 *Comparison of the effects of the synchronous and asynchronous condition upon Spelling errors*

Variables	Groups	*N*	Mean	*SD*	Std. Error Mean	*t*	*df*	*p-value*	effect size (Cohen's *d*)
Spelling Errors (%)	synchronous	28	3.25	2.40	0.45	3.610	83	0.001	0.7 (large)
	asynchronous	57	1.62	1.7	0.22				

compounding effect leading to an increase when counting communication-units. When looking at accuracy, the results revealed that the required task groups outperformed the optional task groups under both synchronous and asynchronous conditions. When looking at spelling errors only, however, the learners did best in the asynchronous mode.

It has been repeatedly pointed out that in CMC-based communication merely having interaction is not enough. What is more critical is the quality of interaction (Bernard *et al*., 2004; Lai *et al*., 2008). In online task-based learning the question that arises is what creates and leads to quality of interaction.

An answer to this question may be found in how learners themselves see the purpose of a task, i.e., how, and to what degree they can relate to it and find it meaningful. This study reveals that students produce more language output in the optional family tree task than in the required task. This can be explained by the fact that students are more motivated and find it easier to talk about matters that concern themselves. One can further argue that this difference can be attributed to

the personalization factor of the optional family tree task. In contrast to the jigsaw task, students may have found the task of sharing personal information more meaningful, in particular since they could relate to it through personal experience. Tasks that are more meaningful to learners may ultimately also increase their level of engagement. Not only the personalization factor but also the real world relationship (Levy & Stockwell, 2006) may have given cause for a genuine communication (Mishan & Strunz, 2003) that was felt to be intrinsically interesting and rewarding (Meskill, 1999).

In the literature on task design, strategies incorporating challenge (Meskill, 1999) or solving problems and puzzles, and playing games (Klapper, 2003) are often suggested in order to provide a driving force that supports learner engagement, motivation and interaction. Some research also suggests that the mandatory aspect in such tasks encourages students to persevere and push for more negotiations and output (Ellis, 2003; Long, 1989; Long & Robinson, 1998). Surprisingly, the finding of this study did not support such claims.

On the contrary, it seems the puzzle-like design may have created a counter-productive effect by limiting rather than encouraging interaction and language production. Although successful task performance was not dependent on reaching a single outcome, nevertheless this task required students to work towards a pre-determined convergent goal. Unlike the optional task, whose outcome was primarily student-determined and open, the outcome of the required task was solely driven by processing task-determined content. It seems that the processing of linguistic input, in addition to deciphering some embedded clues, became an impediment to interaction rather than a driving force. The content-controlling design structure allowed for little flexibility and thus caused a stifling effect. It can be argued that this particular jigsaw task design did not achieve its goal of functioning as a catalyst that would lead students towards increased language engagement.

During the analysis of the transcripts it was also noticed that in the exchange of information there was a tendency among students to focus on information that could be easily retrieved from the verbal descriptions or that was explicitly stated in the tree chart. Some isolated comments from students, such as "I don't have this information" or "Let's go on", or "Good enough", provide some additional peripheral evidence suggesting that students avoided deciphering the textual clues, gave up on a particular thread of information exchange or ultimately were more interested in completing the assignment. More research in this area, however, is needed to investigate student views in order to understand what motivates particular student behavior.

We also asked the question whether operating under synchronous or asynchronous conditions makes an impact on the participants' quantity of language use. Here, the results have revealed no significant differences. Our assumption that in general a synchronous mode accounts for an increase of interaction and thus also more language output was not supported. One difference, however, was found. Students performing in the synchronous mode produced a greater exchange of c-units, that is, of informational content. Thus, the immediacy requirement of a synchronous environment has an advantage over an asynchronous mode by leading to a more communicative exchange.

The study further investigated the effect of the task structure on learners' quality of task performance under different conditions. As suggested by Kitade (2006), it was assumed that the asynchronous environment would be more productive than the synchronous environment given that learners have more time to reflect upon and process morphosyntactic structures in this environment. Therefore, the result that the required task groups demonstrated a higher degree of accuracy than the optional task groups, not only under asynchronous but also under synchronous conditions, was surprising.

The fact that the required task groups revealed a higher degree of accuracy may be explained by the fact that students were able to benefit from the contextual support. The task design may have contributed to this benefit in several ways. Finding the answers not only required frequent interaction with the conversational partner, but also repeated processing of the task input. In this way, learners' attention was drawn to the content and the pre-structured forms multiple times. One might claim, such a task design is highly desirable for learners as it provides repeated focus on form (see Doughty and Long's (2003) distinction between form and formS), i.e., requiring the processing of meaning while also exposing the learners to modeled forms. In addition, the modeling of lexical and morphosyntactic structures in the family descriptions and clues most likely aided the learners in formulating their own answers and questions.

This finding demonstrates that the underlying task design constitutes the primary factor that determines language use. The quantity and quality of errors can only be understood in the context of a particular task assignment and, needless to say, other individual learner factors, whereas the mode itself plays only a minor role. This finding further explains inconsistencies in research; while some studies show a higher degree of accuracy under synchronous conditions (see Hirotani, 2009), others make the claim that asynchronous conditions generally lead to more accurate language use (Kitade, 2006). More research in this area is needed.

When looking at spelling errors separately from grammar errors, the findings revealed no surprises. It seems only obvious that the immediacy requirement, necessitating as it does that students type their responses, leads them to being less concerned about the form of their language in synchronous than in asynchronous environments.

7 Implication for online task design and implementation

The results of these findings have some implications for online task design and implementation. In task-based learning, jigsaw and communication gap designs have received much attention, given that tasks with embedded communication gaps are strongly believed to lead to an increase in negotiations among students (see Blake, 2000; Foster, 1998; Pica *et al*., 1993). Nevertheless, these tasks may not always yield the effects intended. Jigsaw designs that are cognitively too complex, i.e., too narrow in focus or complicated, requiring attention to too many details, may create the opposite effect of what they are expected to achieve. As commonly observed by instructors, many students, when getting frustrated, give up rather than take on the challenge.

Many task designs such as the jigsaw design used in this study or communication gap activities have often been originally conceived for classroom environments that

assume the presence of a teacher. It also has to be noted that such tasks often appear to be fun and exciting, in particular to the teachers. As a consequence, what is often overlooked is that it is the teacher's presence in the classroom that plays a major role in accounting for successful task implementation. In the classroom, teachers can monitor students' behavior which helps them determine whether students are sufficiently prepared and ready. If necessary, they have the option to intervene and assist with problems, making sure students follow task instructions, understand task outcomes and stay on task. In online learning, this is not the case. The lack of the teachers' presence requires sufficient pre-task planning. In many cases, it also warrants task designs that are less prone to breakdown. For such reasons, tasks with flexible, open-ended and student-driven outcomes may guarantee higher success and make for better designs.

In online learning the mode of communication makes a difference and also needs to be taken into account. As Hampel (2006) reminds us, "we have to ensure that tasks are appropriate for the medium and that we take into account the affordances (i.e., the constraints and possibilities for making meaning) of the modes available" (op. cit.: 111). Both synchronous and asynchronous tasks are needed and have the potential to enhance learning, but they have different functions of interaction (Gunawardena and McIssac, 2004; Zhao *et al*., 2005). The asynchronous mode affords advantages that allow for more time and reflection, but on the other hand it lacks the impetus and contextual support found during synchronous interaction. At the same time, the need for an immediate response creates 'technostress' (Peterson, 1997) that leads learners more easily to ignore the aspects of language that warrant attention in language learning.

8 Conclusion

In conclusion, tasks that allow for flexibility in outcome, that is, which allow the students to play a role in determining the content seem to be more effective in producing more output than do required tasks. The effects of the 'required' task, i.e., the particular jigsaw design that was used here, raise questions about jigsaw designs in general. While previous research has suggested that jigsaw tasks in general lead to an increase in negotiations among students (see Blake, 2000; Foster, 1998; Pica *et al*., 1993), these tasks may not always yield the intended results. Jigsaw designs that are too complicated, requiring attention to detail in addition to being performed in "real time" may create too much pressure that will result in some students prematurely giving up rather than encouraging a behavior that prompts further interactions and a drive to communicate and solve a problem. Jigsaw tasks also need to be designed to allow for a range of solutions rather than being too narrow. The mode of communication, i.e., whether students interact synchronously or asynchronously does not seem to make much of a difference in terms of the impact it creates on language output.

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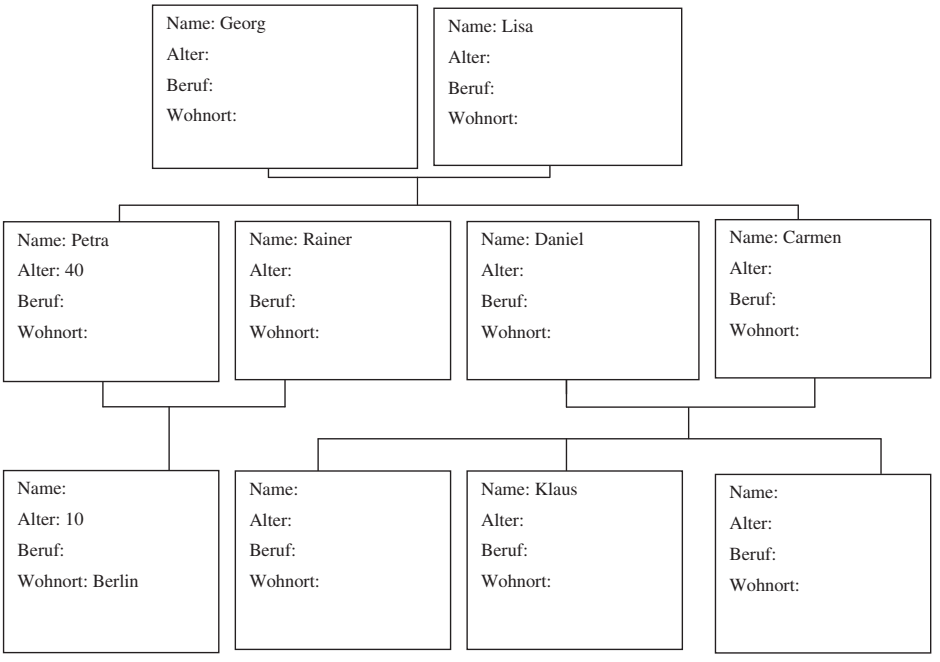
Appendix 1

Filling in a family tree: PARTNER A

You and your partner have different information about this family. **First**, read through the information provided below and fill in as much information as possible. Then, ask **your partner questions** to find out the remaining missing information.

- Der Großvater heißt Georg. [Grandfather's name is George.]
- Lisa hat vier Enkel und ist pensioniert. [Lisa has four grandchildren and is retired.]
- Maria ist die Schwester von Klaus und Felix. [Maria is Klaus and Felix's sister.]
- Julia ist so alt wie ihr Kousin Felix. [Julia is as the same age as Felix's cousin.]
- Carmens Nichte ist 10 Jahre alt. [Carmen's niece is 10 years old.]
- Klaus' Vater heißt Daniel und er lebt in Würzburg. [Klaus's father's name is Daniel and he lives in Würzburg.]
- Petra ist 40 Jahre alt und ihr Ehemann ist vier Jahre älter. [Petra is 40 years old and her husband is four years older.]
- Georg hat zwei Töchter. [Georg has two daughters.]
- Carmen ist Sekretärin. Sie lebt mit ihrem Mann und Kindern in Würzburg. [Carmen is a secretary. She lives with her husband and children in Würzburg.]



Filling in a family tree: PARTNER B

You and your partner have different information about this family. **First**, read through the information provided below and fill in as much information

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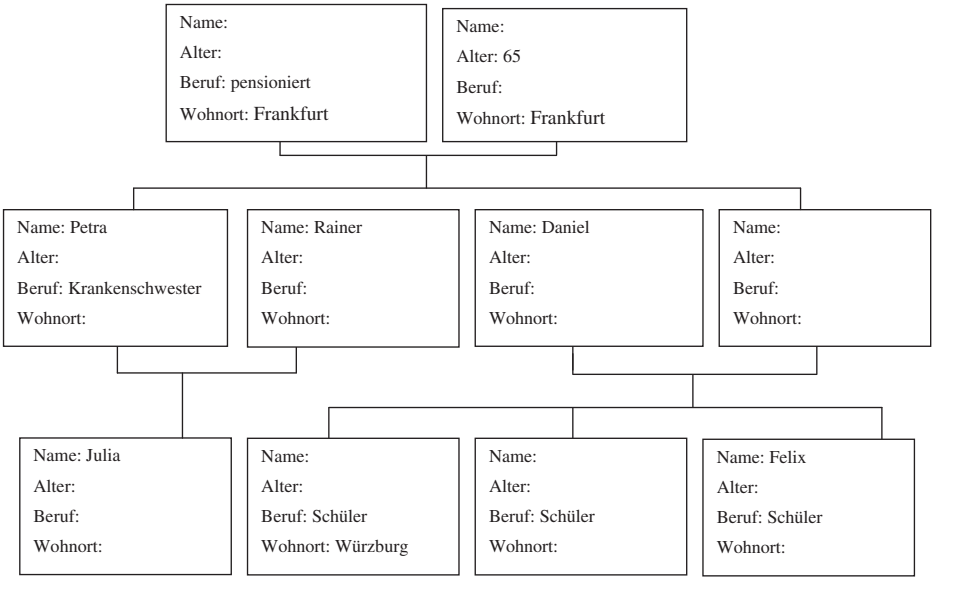
as possible. Then, ask **your partner questions** to find out the remaining missing information.

- Petras Mutter ist 65 Jahre alt. Sie und ihr Mann leben in Frankfurt. [Petra's mother is 65 years old. She and her husband live in Frankfurt.]
- Julia, Lisas Enkelin, hat keine Geschwister. [Julia, Lisa's grandchild, has no brothers and sisters.]
- Daniels Schwiegervater ist 71 Jahre alt und er arbeitet nicht mehr. [Daniel's father in law is 71 years old and does not work any more.]
- Felix geht mit seinen Geschwistern in Würzburg zur Schule. [Felix goes to school with his brothers and sisters in Würzburg.]
- Julia ist vier Jahre älter als Maria. [Julia is four years older than Maria.]
- Petra ist mit Rainer verheiratet. [Petra is married to Rainer.]
- Felix ist zwei Jahre älter als Klaus. [Felix is two years older than Klaus.]
- Julias Eltern leben in Berlin. Sie ist Krankenschwester und er ist Zahnarzt. [Julia's parents live in Berlin. She is a nurse and he is a dentist.]
- Daniel ist ein Jahr jünger als Petra und ein Jahr älter als seine Frau. [Daniel is one year younger than Petra and one year older than his wife.]
- Julias Onkel ist Photograph. [Julia's uncle is a photographer.]



Appendix 2

The following provides the task descriptions for Group 1 and 4.

Group 1: Task description

Drawing a family tree. The goal of this task is to find out about your partner's family and draw a family tree. Ask as many questions as you need to.

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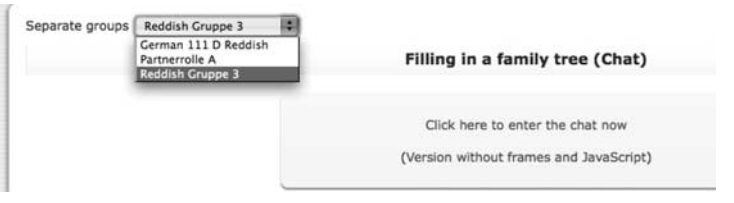
The family tree should include at least three generations.

a. grandparents' names, what they do (or did), their age (or how old they were), where they live (or lived),
b. their children and/or your parents, their age, profession, where they live
c. your brothers and sisters, what they do, their age, where they live

1. Contact your chat partner and agree upon a time when you both can meet in the CHAT ROOM to work on the assignment.
2. VERY IMPORTANT! Make sure you have selected the correct group. In the upper left corner, from the pull down menu select the group, which you have been assigned by your instructor. Your group name should say:

Teacher's Name Group Number. **Here is an example:**



3. When you are finished draw the family tree, and give it to your instructor.

Group 4: Task description

Task instructions: Filling in a family tree A/B. The goal of this task is to complete the chart of a family tree. Specifically, your goal is to find out all the family members' names, what they do, where they live, and how old they are. As you and your partner have different pieces of information about the family, you need to interact with each other to complete this assignment.

1. First, read through the clues that are provided on your handout and fill in as much information as possible.
2. Then, ask your partner to find out the remaining missing information. **Do so, by posting your questions or family description to the forum**. You can find the link to the forum in module 16 entitled "**Post your answers to the forum"**.

Forum task description and instructions. The goal of this task is to complete the chart of a family tree. Specifically, your goal is to find out all the family members' names, what they do, where they live, and how old they are.

1. Before you get started, make sure you have downloaded and printed out the family tree. Also, read through the clues first and fill in the missing information.
2. Then, post your questions to the forum and ask questions about the missing information. After you have done so, please send your partner an email

informing her/him that you have done so. **PLEASE DO NOT SEND your questions via email**. Otherwise, your instructor will not be able to evaluate your work. It is entirely up to YOU when you respond to your partner's questions. Nevertheless, feel free to check the forum on a regular basis and send your partner a reminder to answer and post questions, if necessary. You have a period of maximum one week to figure out the **missing answers to the family tree**.

When posting questions for your discussion partner, each of you has the option to start a Q & A thread about missing information in your family tree. START BY ADDING A NEW DISCUSSION TOPIC IN THIS FORUM. Within each Q&A thread, each of you can reply or ask as many follow-up questions as you want. **Note**: If each of you starts a separate forum discussion, i.e., thread, you have to keep track of both Q & A threads. An alternative strategy would be that only one of you starts a forum discussion and both of you post and answer questions within one thread.