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# Integration of Chatting Technology in the Tandem Language Exchange Learning Process

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#### ABSTRACT

**Background.** 21st century learning demands the integration of technology to meet the demands of current developments. In the context of language learning, Tandem Language Exchange is a modern method that stands out by utilizing chat technology.

**Purpose.** The main aim of this research is to evaluate the impact of tandem chat integration in Tandem Language Exchange on students' language skills. In addition, this research aims to provide practical guidance for the development of innovative language learning approaches using chat technology, by contributing to understanding the potential of chat technology in language learning.

**Method.** This research uses a quantitative approach with a survey model. Respondents consisted of English and Arabic primary language students at various universities in Indonesia. The survey results were analyzed using the Miles Huberman model and presented in chart form.

**Results.** Of the 30 respondents, the majority of students felt significant benefits from integrating chat technology in language learning. The frequency of use of Tandem Language Exchange is quite high, reflecting students' active interest and involvement. Apart from that, the survey results also show that students' comfort level in using chat technology is generally positive, with the majority feeling comfortable or very comfortable.

**Conclusion**. The integration of chat technology in Tandem Language Exchange has an overall positive impact, supporting the development of language skills and motivating students to be actively involved in the learning process. Despite some reported obstacles, high acceptance shows the great potential of using chat technology in language learning contexts in this digital era. Future recommendations could focus on improving guidance and support to ensure the use of chat technology is more effective and satisfying for students.

#### KEYWORDS

Chatting Technology, Learning Integration, Tandem Language Exchange.

## **INTRODUCTION**

The rapid development of digital technology has completely changed the paradigm of human life, creating new dynamics in the way we interact, work and learn (Saykili, 2019).



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304.



The digital revolution that occurred in the 21st century has had a significant impact on various sectors, including education (González-Pérez & Ramírez-Montoya, 2022). In the midst of the complexity of challenges that are increasingly emerging in the era of globalization, it is important for the world of education to adapt to these developments. Digital technology is the main catalyst for this change, bringing major implications to the learning process (Qurat-ul-Ain et al., 2019).

The importance of preparing students to face increasingly complex challenges is becoming the center of attention in the new paradigm of 21st century education (Auld & Morris, 2019). Not just transferring knowledge, but learning must also be able to develop 21st century skills such as creativity, collaboration, problem solving and communication skills. In this context, digital technology is one of the main pillars to achieve this goal (Brunetti et al., 2020). One interesting innovation in the context of language learning is the tandem chat application.

Language learning in the 21st century requires a more dynamic and responsive approach to technological developments (Bumela, 2020). Tandem chat applications appear as a promising solution to enrich the language learning process (Rahimi & Fathi, 2022a). The unique concept of tandem chat lies in the use of chat technology as a means of interaction, allowing students to communicate directly with foreign speakers (Carluccio & Rubakova, 2019). In this way, the app combines elements of language practice with social learning, creating a more contextual and dynamic learning environment.

The rapid growth of tandem chat applications opens up new opportunities in optimizing the language learning process (Liu, 2023). The possibility of interacting with non-native speakers directly, via digital platforms, provides a more authentic language experience (Aleven & Koedinger, 2002). Even though the potential is large, implementing a tandem chat application cannot be separated from a number of challenges that need to be overcome. This challenge includes technical, methodological and interactive aspects that require a careful and planned approach. Therefore, this research will try to dig deeper into the integration of chat technology in the context of Tandem Language Exchange learning. Through a deeper understanding of the potential and challenges of the tandem chat application, it is hoped that this research can make a significant contribution to the development of innovative language learning methods that suit the needs of students in this digital era (Jain et al., 2022). In this way, language learning can become more relevant, interesting and effective, preparing students to face the global demands of the 21st century.

Although tandem chat applications promise significant progress in language learning, there are a number of problems that require special attention (Clark et al., 2019). First, it is necessary to pay attention to how to optimize the use of chat technology in the context of language learning. The use of tandem chat applications must be directed to provide maximum contribution to the development of students' language skills (Hansell et al., 2021). Second, there are concerns regarding the effectiveness of interactions between non-native speakers in virtual environments. This requires specific strategies to ensure that interactions meet the standards of good and effective communication. Finally, how to support students' active participation in the learning process is an important aspect that needs to be considered.

To overcome these challenges, a planned and evidence-based approach needs to be designed. The proposed strategy involves designing a learning method based on chat technology that is structured and oriented towards learning goals. One of the key steps is to integrate special features in the tandem chat application, such as thematic discussion rooms and guidance from mentors, to improve the quality of interaction between foreign speakers. In this way, students' active participation can be better maintained and the learning process can take place more effectively. A number of previous studies have evaluated the participation and benefits of adult participants with limited second language (L2) proficiency in e-tandem learning. Focusing on a six-week guided e-tandem project, British participants, after completing a beginner's Mandarin course, interacted with Chinese partners who were undergraduate students at Beijing Foreign Studies University with a higher level of English proficiency. This asymmetry poses special challenges. Through analysis of emails, Skype transcripts, interviews, surveys, and learning notes, this research sheds light on L2 development and cross-cultural learning, albeit at high cost to participants. Conclusions based on participant feedback suggest modifications to the e-tandem model to provide more effective support for participants experiencing difficulties, creating a less challenging but still rewarding experience. These findings have pedagogical implications for the development of future e-tandem projects, especially in supporting e-tandem exchanges with asymmetries or participants who have limited levels of L2 proficiency (Lewis & Qian, 2021).

Further research, this study uses a sequential explanatory mixed methods approach to assess the impact of e-tandem on the speaking skills and willingness to communicate (WTC) of English as a foreign language (EFL) learners. Two classes at a language institute were divided into an experimental group (e-tandem) and a control group (conventional). The e-tandem group, which communicated online with non-native speakers using the Tandem application, showed better results in the development of speaking skills and WTC compared to the conventional group. Thematic analysis of qualitative data shows e-tandem students' positive attitudes towards collaborative speaking activities. Pedagogical implications are discussed for collaborative speaking courses in EFL environments (Rahimi & Fathi, 2022b).

Third research, this research investigates the role of teachers in virtual tandem learning in curriculum-based language classes. We explore teacher interactions in virtual and physical classroom environments. Data consisting of video and screen recordings show that virtual tandem learning tends to be highly student-focused, with more limited teacher interaction compared to face-to-face tandem learning in formal school contexts (Hansell et al., 2021).

All three previous studies highlight the positive impact of using technology in learning language, especially through e-tandem and tandem chat methods. The first research shows the effectiveness of e-tandem learning on EFL students' speaking skills and communication desires. The second study emphasized the limitations of teacher interactions in tandem virtual environments. Meanwhile, the third research focuses more on informal language learning through tandem chat applications. From here, further research that focuses on the integration of tandem chat in the Tandem Language Exchange is expected to provide deeper insight into the potential of chat technology in improving students' language skills and provide practical guidance for the development of innovative language learning methods. This research is expected to make a significant contribution to the understanding and application of chat technology in the context of language learning.

In order to answer the research questions, this research will use a quantitative survey method. This survey will be directed to students who are involved in language learning via the tandem chat application. The use of the quantitative survey method is expected to provide strong data that can be analyzed statistically to measure the impact of tandem chat integration in language learning.

The main aim of this research is to evaluate the impact of tandem chat integration in the Tandem Language Exchange learning process on students' language skills. Apart from that, this research also aims to provide practical guidance for developing innovative language learning approaches using chat technology. Thus, this research seeks to contribute to our understanding of the potential application of chat technology in language learning contexts.

By involving students in the use of tandem chat applications, this research hopes to provide a deeper understanding of the potential application of chat technology in learning contexts. Language. It is hoped that the results of this research can contribute to the development of more effective learning methods and motivate students to actively participate in the language learning process. In addition, it is hoped that this research can provide a basis for developing educational policies that support the integration of chat technology in language learning in higher education institutions.

#### **RESEARCH METHODOLOGY**

This research adopts a quantitative research design with a survey approach to evaluate the impact of using Tandem Language Exchange in a language learning context, especially for students. The main focus of this research is to identify students' perceptions and experiences regarding the effectiveness of Tandem Language Exchange in improving their language skills. A quantitative design was chosen to provide an in-depth and structured statistical analysis framework, allowing a deeper understanding of the impact of using this method (Guest et al., 2020).

In the first stage, data collection techniques using random sampling were carried out to select respondents who were active students in language learning using Tandem Language Exchange. This step was taken so that the selected sample could adequately represent the population of language learning students who use this method. The survey will then be structured with questions designed to elicit information related to participants' perceptions, satisfaction and experiences with Tandem Language Exchange.

The data analysis technique that will be used is the Miles and Huberman technique. This analysis involves three stages, namely data reduction, data presentation, and drawing conclusions ("Qualitative Data Analysis," 2020). In the data reduction stage, survey answers will be processed and categorized according to certain patterns or themes. The reduced data will then be presented in a structured manner to facilitate interpretation. The final step involves drawing conclusions based on the findings that emerge from the data analysis, which will provide a holistic picture of how Tandem Language Exchange impacts students' language skills.

It is important to note that this research has a specific focus on the impact of using Tandem Language Exchange, and the choice of survey method is desirable can provide broad and in-depth insight from the perspective of language learning students. Pedagogical implications and practical recommendations are also expected to emerge from this in-depth data analysis, contributing to our understanding of the application of technology in language learning contexts.

#### **RESULT AND DISCUSSION**

#### **Frequency of Use of Tandem Language Exchange**

Frequency of Use of Tandem Language Exchange indicates the extent to which students are involved and immersed in the experience of tandem language exchange (Batardière & Jeanneau, 2020). This is not simply a measure of attendance, but rather a reflection of the intensity of student involvement in the activity. As an active step in enriching language learning, this frequency reflects how students routinely and continuously use Tandem Language Exchange to interact with foreign speakers (Álvarez Valencia & Fernández Benavides, 2019).

Not limited to just communicating, this frequency of use shows how often students establish consistent dialogue with exchange partners their language. These activities can include everyday conversations, in-depth discussions on specific topics, or even collaborative projects that require a deep understanding of the language (Bouncken & Aslam, 2019). In other words, the frequency of use of Tandem Language Exchange is a reflection of how deeply learners are involved in the

language learning process. It is important to note that frequency of use not only includes direct interactions with non-native speakers but also involves designing structured language learning experiences (Qian et al., 2019). This means that students not only communicate to communicate, but also actively design experiences that include practical aspects of language and the application of social learning.

As far as developing language skills and cross-cultural understanding is the focus, the frequency of use of Tandem Language Exchange provides an indication of the extent to which students utilize opportunities to deepen their understanding (Shadiev & Yu, 2022). This is what makes the difference between simply attending a language exchange session and actually creating a rich and immersive language learning experience.

#### **Comfort Level Using Chatting Technology**

Comfort Level Using Chatting Technology involves more than just evaluating the physical comfort of using a chat platform (Nobrega et al., 2021). This creates the foundation for a collaborative experience that is not only comfortable but also satisfying, as an integral element of Tandem Language Exchange (Appel & Pujolà, 2021). When students assess the level of comfort, they substantially involve their perception of the chat technology interface used.

In this context, subjective assessments of technology interfaces include considerations of design clarity, intuitive navigation, and effective usability. A user-friendly interface can increase comfort levels and minimize technical barriers that can disrupt the language learning experience (Sutherland et al., 2021). Evaluation of security in online communication is an important aspect, where students consider the extent to which chat technology provides a sense of security and privacy in the exchange of language information (Saputra, 2022).

The flexibility of chat technology is also a center of attention, considering the extent to which the platform can be adapted to the learning style and preferences of participants educate. This includes the ability to adjust the difficulty level of conversations, provide a choice of different types of learning content, and support the individual needs of learners (Kasneci et al., 2023). The level of comfort is not only related to clarity and security, but also to the extent to which chat technology can be adapted to each learner's learning style and needs.

As an integral part of Tandem Language Exchange, this level of comfort not only creates a supportive atmosphere, but is also a key factor in maintaining student participation and involvement. In optimizing the comfort level of using chat technology, language learning platforms can create immersive collaborative experiences, allowing learners to feel satisfaction and accomplishment in their language learning journey.

#### **Evaluation of the Effectiveness of Chatting Technology Integration**

Evaluation of the Effectiveness of Chatting Technology Integration manifests a holistic approach to evaluating the extent to which the use of chatting technology has influenced and enriched Tandem Language Exchange (Chang et al., 2023). More than just an examination of results, this evaluation includes a thorough analysis that opens a window into how chat technology enriches students' language learning experiences.

In assessing the achievement of learning objectives, this effectiveness evaluation considers the extent to which students successfully develop desired language skills through the use of technology chat. From improving speaking skills to vocabulary mastery, this evaluation examines the positive impacts that are expected to be achieved. In addition, technological efficiency is the focus of the analysis, evaluating the extent to which chat technology provides an effective and efficient tool for achieving language learning goals.

The importance of the level of student satisfaction cannot be ignored in this evaluation. Effectiveness evaluation not only measures learning achievement but also involves how well chat technology meets students' expectations and needs (Heffernan, 2022). By considering the level of satisfaction, this evaluation provides insight into the extent to which the use of chat technology creates a learning environment that motivates and supports students.

Through this holistic approach, effectiveness evaluation becomes not only an instrument for measuring results, but also a tool for detailing development potential and continued improvements (Kioupi & Voulvoulis, 2019). The comprehensive analysis provides a more complete and in-depth picture of the role of chat technology in creating a dynamic and responsive learning experience within Tandem Language Exchange. Thus, this evaluation is not only about achievements, but also about transformations and breakthroughs in modern language learning approaches.

#### **Impact on Language Learning Motivation**

Impact on Language Learning Motivation shows a shift in the dynamics of student motivation, along with the integration of chat technology in Tandem Language Exchange (Reinhardt, 2019). These changes not only include increasing intrinsic motivation, such as interest and desire to understand the language, but also extrinsic motivation, such as enthusiasm for learning and active participation.

The integration of chat technology creates an additional layer that enriches students' language learning experience (Adamopoulou & Moussiades, 2020). Increased interest can be seen from students' interest in engaging in direct interaction with foreign speakers via chat platforms. Activities carried out in the Tandem Language Exchange can directly revive enthusiasm for learning, because students can see concrete results from their efforts in improving language skills.

Increased enthusiasm for learning can be reflected in students' active participation in language learning activities (Mystkowska-Wiertelak, 2022). Chat technology opens up opportunities for students to engage in in-depth discussions, exchange of ideas, and collaborative projects (Yu & Yuizono, 2021). Thus, students' extrinsic motivation to participate actively in Tandem Language Exchange is stimulated by a dynamic and interesting learning environment.

The positive impact on motivation is not only limited to individual aspects, but can also form a positive classroom climate. Motivated students tend to contribute more actively to group interactions, support and motivate others, and create a positive atmosphere around language learning. As an indicator of success, the impact on motivation can be considered as an expected result of the chat technology integration strategy, indicating that language learning is not only effective but also enjoyable and motivates students to continue to develop.

#### **Survey results**

After distributing the questionnaire to language students, the first question was, How often do you use Tandem Language Exchange in your language learning? With answer options: Every day, Several times a week, Once a week, Rarely and Never. With the following answer results:



Figure 1. How often do you use Tandem Language Exchange in your language learning?

The survey results provide an interesting picture of the extent to which language students utilize Tandem Language Exchange in their learning. Of the 30 respondents involved, 10% of them use the platform daily, indicating a high level of engagement. This may reflect their desire to continue to deepen their understanding of the language they are learning through direct interaction with native speakers. Meanwhile, the large majority, namely 63.3%, use Tandem several times a week, indicating consistency in the integration of this activity into their learning routine. This can be interpreted as evidence that Tandem Language Exchange is a significant learning source for the majority of respondents.

However, along with this activity, 26.7% of respondents admitted that they rarely use or never use Tandem in their language learning. Perhaps this is due to time constraints or a preference for more traditional learning methods. Further analysis may be required to understand the reasons behind this choice. Additionally, the lack of respondents using Tandem Language Exchange once a week may indicate that this frequency is not a primary choice among the Language students participating in this survey. It is also worth considering whether the offerings and features of the platform meet their needs.

In interpreting the results of this survey, it is important to consider the various factors that may influence a student's decision to use Tandem Language Exchange. Factors such as ease of access, sustainability of motivation, and personal preferences can play an important role in shaping patterns of use of these platforms. Through a deeper understanding of the reasons behind each respondent's choice, educational institutions can develop more effective strategies in promoting the use of additional learning resources, such as Tandem Language Exchange, to support the development of students' language skills.

Next question, What is your comfort level in using chat technology in the Tandem Language Exchange process? With ospi answers as follows: Very comfortable, Comfortable, Neutral, Uncomfortable and Very uncomfortable. With the following answer results:



**Figure 2.** What is your comfort level in using chat technology in the Tandem Language Exchange process?

The survey results reflect the positive attitudes of language students towards the use of chat technology in the Tandem Language Exchange process. Of the 30 respondents, the large majority, as much as 70%, stated that they felt comfortable using chat technology. This shows strong adoption of the platform as an interactive language learning tool. This feeling of comfort can make a positive contribution to the learning experience, allowing students to easily engage in language conversations and gain direct experience with native speakers or fellow language learners.

Along with the majority who feel comfortable, as many as 20% of respondents stated that they were neutral regarding comfort using chat technology. This could mean that there is a small portion of students who may still be considering the extent to which they can utilize the potential of chat technology in their language learning. In this context, educational institutions can provide additional support, training, or resources that can help them feel more confident and skilled in utilizing Tandem Language Exchange's features. comfortable or very uncomfortable.

This can be interpreted that, overall, language students who participated in this survey had a positive level of comfort regarding the use of chat technology in language learning. Therefore, educational institutions can utilize these findings to strengthen support for the integration of chat technology in language learning strategies, considering the importance of online interaction in supporting the development of students' language skills.

Next question, How effective do you think the integration of chat technology is in improving language skills through Tandem Language Exchange? With the following answer options: Very effective, Effective, Fairly effective, Less effective and Not effective. With the following answer results:



**Figure 3.** How effective do you think the integration of chat technology is in improving language skills through Tandem Language Exchange?

The survey results revealed positive views from language students regarding the effectiveness of the integration of chat technology in improving language skills through Tandem Language Exchange. As many as 76.7% of respondents stated that this approach was effective, and 16.7% even considered it very effective. These results reflect the recognition that the use of chat technology in language learning, especially through the Tandem Language Exchange platform, has a positive impact on the development of students' language skills.

Although the majority were satisfied with its effectiveness, a small number of respondents, namely 6.7%, stated that the integration was quite effective. These perceptions may indicate variations in individuals' experiences or expectations regarding expected learning outcomes. Therefore, further research or in-depth interviews may help better understand the factors that influence these assessments.

The results of this survey provide a strong basis for educational institutions to continue to increase the use of Tandem Language Exchange as a language learning tool. Further strategies could involve providing more detailed user guides, organizing workshops, or even integrating Tandem activities directly into the language learning curriculum. In this way, institutions can maximize the benefits of chat technology to increase the effectiveness of language learning and better meet students' needs.

Next question, Do you feel that chat technology helps in enriching your language learning experience? With the following answer options: Very helpful, Helpful, Neutral, Not very helpful and Not helpful. With the following answer results:





The survey results reflect the optimistic views of language students regarding the contribution of chat technology in enriching the language learning experience. As many as 80% of respondents felt that the use of chat technology, especially through Tandem Language Exchange, had a positive impact on their learning experience. Of this number, 63.3% found it helpful, while 16.7% stated that chat technology was very helpful.

The importance of the contribution of chat technology should not be ignored, because it can enrich the language learning experience through direct interaction with native speakers or fellow language learners. Although a small number of respondents (20%) expressed a neutral attitude, the survey results generally show that chat technology has a positive role in improving the quality of student language learning.

These findings provide an indication that the application of chat technology, especially through the Tandem Language Exchange platform, can continue enhanced and supported as an integral part of language learning strategies in educational settings. By understanding that most students see chat technology as a helpful and enriching aspect, educational institutions can focus more on developing and optimizing these features to support the achievement of language learning goals.

Next question, To what extent do you think the integration of chat technology can increase motivation Are you into language learning? With the following answer options: Greatly increases motivation, Increases motivation, Slightly increases motivation, Not much influence and Not at all. With the following answer results:



**Figure 5.** What extent do you think the integration of chat technology can increase motivation Are you into language learning?

The survey results reflect the positive views of the majority of language students regarding the impact of the integration of chat technology on their motivation in language learning. Half of the respondents, namely 50%, firmly stated that the use of chat technology greatly increased their motivation. Meanwhile, another 36.7% of respondents reported that the integration of chat technology generally increased their motivation.

Although there was a small number of respondents (13.3%) who felt that the impact only slightly increased motivation, it should be noted that no one stated that chat technology did not has a lot of influence or even none at all. This confirms that interaction in language through chat technology, especially through the Tandem Language Exchange platform, provides a significant boost to students' enthusiasm for learning.

The results of this survey provide encouragement for educational institutions to further strengthen learning strategies that utilize chat technology. With the understanding that this integration not only improves language skills but also has a positive impact on motivation, institutions can focus more efforts on developing curricula and learning methods that harness the full potential of chat technology. Thus, chat technology can be an effective tool for improving the quality and continuity of student language learning.

Next question, Have you experienced any particular obstacles or challenges in using chat technology in Tandem Language Exchange? With the following answer options: None, Slight obstacles, Some obstacles, Significant obstacles and Obstacles that hinder. With the following answer results:



Figure 6. Have you experienced any particular obstacles or challenges in using chat technology in Tandem Language Exchange?

The survey results show that the majority of language students, namely 46.7%, do not experience problems in using chat technology in Tandem Language Exchange. This indicates the level of comfort and smooth use of the platform for the majority of survey participants. This condition reflects the success of the Tandem Language Exchange organizers in providing a smooth and hassle-free user experience for the majority of students.

However, a small number of respondents faced obstacles in using chat technology. As many as 30% of respondents reported some obstacles, mainly related to lack of vocabulary, while 23.3% faced several obstacles, including a lack of consistency. Although these challenges were not considered significant by the majority of respondents, further understanding of these types of obstacles can provide valuable insight for Tandem Language Exchange organizers to improve the user experience and address issues that may arise.

Further recommendations could involve Tandem Language Exchange organizers in careful listening feedback from respondents who experienced problems. Thus, development efforts can be focused on improving features or providing guidance that can help overcome identified obstacles, so that the use of chat technology in language learning can be more effective and satisfying for all users.

Next question, What do you think about the integration of chat technology as a part of the overall Tandem Language Exchange learning process? With the following answer options: Very positive, Positive, Neutral, Negative and Very negative. With the following answer results:



**Figure 7.** hat do you think about the integration of chat technology as a part of the overall Tandem Language Exchange learning process?

The survey results show that language students' views on the integration of chat technology in Tandem Language Exchange learning are overall very positive. As many as 90% of respondents expressed a very positive opinion, while 10% expressed a positive opinion. The inequality of these numbers confirms the high level of satisfaction with the use of chat technology as a tool for interacting and deepening language understanding.

No respondents expressed neutral, negative, or very negative opinions, reflecting the extraordinary level of acceptance of the integration of chat technology in the context of Tandem Language Exchange. This success can be considered a positive indicator that this approach meets students' needs and expectations in developing their language skills.

This positive understanding provides a strong basis for Tandem Language Exchange organizers to continue developing and improving features and user experience. Further recommendations could focus on providing additional support or training resources to ensure that students can exploit the full potential of language learning through chat technology. The success of this integration can also be an inspiration for other educational institutions to explore and adopt similar strategies to improve language learning for their students.

#### CONCLUSION

The survey results regarding the use of chat technology in the context of Tandem Language Exchange show a very positive picture. Of the 30 respondents, the majority of language students felt significant benefits from the integration of chat technology in language learning. The frequency of use of Tandem Language Exchange is also quite high, with the majority of respondents using the platform several times a week. This reflects students' active interest and involvement in improving their language skills through online interactions. The importance of comfort in using chat technology can be seen from the survey results regarding students' comfort levels. As many as 70% of respondents felt comfortable, while 20% were neutral regarding the use of chat technology in language learning. This shows the need to pay attention to students who may need additional support or guidance to feel more confident in using chat technology.

The positive impact of chat technology also includes motivational aspects in language learning. The majority of respondents felt that the integration of chat technology greatly improved or increased their motivation. The fact that a large number of respondents gave this positive assessment shows that chat technology is not only effective in improving language skills, but also provides a positive boost to students' enthusiasm for learning.

Although there were a small number of respondents who reported several obstacles, such as a lack of vocabulary or a lack of consistency, This number is relatively small and does not preclude a high level of acceptance of chat technology in Tandem Language Exchange. In conclusion, the survey results show that the integration of chat technology in language learning through Tandem Language Exchange has an overall positive impact, supporting the development of language skills and motivating students to be more actively involved in the learning process.

### **AUTHORS' CONTRIBUTION**

Look this example below:

Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.

Author 2: Conceptualization; Data curation; In-vestigation.

Author 3: Data curation; Investigation.

Author 4: Formal analysis; Methodology; Writing - original draft.

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