

# Intelligent Tutoring Systems as Communication Technologies for Enhancing Second Language Learning

Olha Dienichieva, Natalia Plakhotniuk, Olena Svysiuk, Svitlana Kukharonok and Oleg Makarevych  
*Zhytomyr Polytechnic State University, Chudnivska Str. 130, 10005 Zhytomyr, Ukraine*  
*olhadienichieva@gmail.com, nat.pl2002@gmail.com, ktpl\_sov@ztu.edu.ua, kim\_kss@ztu.edu.ua, makarevoleg@ukr.net*

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**Abstract:** This study examines Intelligent Tutoring Systems (ITSs) as communication technologies within second language learning in higher education. Rather than viewing ITSs solely as adaptive instructional tools, the research focuses on their communicative functions in mediating learner–system interaction, supporting learner autonomy, and sustaining engagement in digitally mediated English language learning environments. The study adopts a mixed-methods research design combining questionnaire data and learning analytics collected from 300 undergraduate students studying English as a second language. The questionnaire explored students’ perceptions of ITSs across three dimensions: communicative interaction and language skill development, adaptivity and usability, and overall instructional effectiveness. The results indicate that students most frequently use ITSs for listening, reading, and controlled speaking and writing practice, which they associate with improvements in pronunciation, fluency, and communicative confidence. Personalized feedback, flexible pacing, and opportunities for repeated practice were identified as key factors supporting learner autonomy and sustained engagement. At the same time, the findings reveal limitations in the communicative depth of ITSs, particularly in open-ended speaking and writing tasks, and highlight students’ expectations for more interactive and dialogic features. The study concludes that Intelligent Tutoring Systems function as communicatively oriented learning environments that mediate interaction and support self-regulated second language learning, while emphasizing the need for pedagogically grounded integration and further development of their communicative capacities.

## 1 INTRODUCTION

Advances in artificial intelligence and digital learning environments have significantly reshaped approaches to instructional design, particularly in contexts characterized by linguistic diversity. In contemporary educational and professional contexts, competence in a second language, especially English, has increasingly become a functional requirement rather than an optional asset. Learners, therefore, need instructional tools that extend beyond linguistic knowledge to support meaningful communication across cultural and situational contexts.

To address these evolving needs, many institutions are adapting digital platforms that can adjust instruction to individual learners. Intelligent Tutoring Systems (ITSs) have become central to this shift, as they offer structured support that adapts continuously to learners’ progress and communicative needs [1].

Current Intelligent Tutoring Systems represent a substantial departure from earlier forms of computer-based learning software. Through AI-based analytics, these systems monitor learner behaviour, identify performance patterns, and adapt instructional tasks to individual learning trajectories. Research by Le, Jia, and Annuš highlights how these systems cultivate sustained learning by providing immediate, individualized feedback and flexible environments in which learners can make informed choices about their study routines [2]. By responding dynamically to learner input, such as accuracy, hesitation, or error patterns, ITSs create immediate instructional exchanges that can enhance the relevance of second language practice.

The expanding role of digital instruction in schools and universities has increased the visibility and adoption of Intelligent Tutoring Systems. As institutions confront ongoing challenges, such as the need to support remote or hybrid learning, increasing

classroom diversity, and persistent demands for equitable access to high-quality instruction, ITSs function as communication interfaces that organize how students engage with digital content [3]. These systems enable differentiated task design, promote learner responsibility, and provide greater flexibility in how and when learning occurs [4]. According to C. Lin, A. Huang and O. Lu, evidence also shows that appropriately designed ITSs can reinforce affective components of language learning, including motivation and sustained engagement—elements that are essential for long-term proficiency development [1].

Effective integration of ITSs in language education depends on factors that extend beyond mere technological availability. Considerable variation exists in learners' digital literacy, as well as in how ITS designers implement adaptivity, feedback mechanisms, and user guidance [5]. Language learners also navigate complex digital environments that include translation applications and online reference tools governed by distinct communicative logics [6]. Understanding how learners coordinate these tools: how they respond to the communicative mechanisms embedded within ITSs—remains an important research priority. Such insights can contribute to more intentional instructional planning and more coherent second language learning environments [7].

Taken together, these trends underscore the importance of closely examining the role of intelligent educational systems as communication technologies in second language acquisition. As AI-driven learning tools evolve rapidly and global demand for English proficiency continues to rise, there is a compelling need to analyse how students actually experience these systems. This study, therefore, investigates how learners engage with intelligent tutoring platforms and how such platforms contribute to the development of core linguistic competencies. The findings aim to illuminate strategies for using ITSs to design effective, communicatively rich second language learning environments.

## 2 RESEARCH GOALS

This study investigates the communicative functions of Intelligent Tutoring Systems in second language learning contexts, focusing particularly on their ability to deliver highly individualized instructional guidance and sustain learner motivation. The study specifically examines ITSs as communication

technologies that mediate learner–system interaction. Beyond outlining what ITSs can do, the research examines how their communicative design, which refers to the way prompts, feedback, and instructional messages are structured to support meaningful interaction, shapes contemporary language-teaching practices, fosters learner autonomy, which is the ability to manage and evaluate one's own learning, and facilitates interaction in digitally mediated environments.

A further objective is to analyse how effectively ITSs maintain learner engagement, adjust feedback to evolving learner needs, and promote active participation in virtual learning spaces. The practical contribution of the study lies in outlining pedagogically grounded approaches for integrating ITSs into routine language teaching. In doing so, the research seeks to support the development of instructional models that are adaptable, communication-oriented, and resilient in the face of ongoing educational change.

## 3 RESEARCH METHODOLOGY

Recent scholarship demonstrates that Intelligent Tutoring Systems (ITSs) and communication technologies play an increasingly influential role in digitally mediated language learning. ITSs and AI-driven platforms that monitor learner performance and adapt instruction have been shown to support a wide range of cognitive and affective learning processes [1], [2]. In addition, empirical studies confirm that ITSs enhance reading comprehension, promote effective strategy use, support vocabulary development, and contribute to overall academic progress in English as a foreign language [11]. These systems personalize instruction by diagnosing errors, offering immediate feedback, and adjusting task difficulty, features that are central to adaptive learning environments.

Beyond cognitive benefits, recent work highlights the emotional and motivational dimensions of ITSs. Affective ITS models have demonstrated the potential to enhance learner engagement and reduce anxiety by responding to emotional states and providing supportive feedback [8]. Evidence from recent studies suggests that ITSs support the development of learner autonomy by allowing students to regulate their own pacing, make strategic learning choices, and engage in reflective practices [7], [9]. Studies from adjacent fields, such as programming education, further show that ITSs effectively support learners with different prior

knowledge levels, suggesting strong potential for differentiated instruction in language learning contexts [10].

From a communication technologies perspective, digital platforms actively mediate interaction by influencing how learners interpret guidance, negotiate meaning, and develop knowledge. ITSs, although automated, function as communication technologies by structuring learner–system dialogue through prompts, hints, corrections, and explanations. According to X. Weng and T. K. F. Chiu, communication technologies that mediate interaction among learners, instructors, and automated systems complement ITSs by facilitating multimodal communication and sustained engagement [4]. These technologies enable authentic interactional opportunities, peer collaboration, and continuous access to digital resources—affordances that are essential for language learning and intercultural competence [4]. In ITS environments, system-generated prompts, hints, and explanations structure learner attention and shape task interpretation.

Rather than producing learning benefits through isolated features, the effectiveness of Intelligent Tutoring Systems emerges from the interaction between adaptive instruction and communicative system design. Prior research indicates that learners engage more deeply when feedback is not only personalized but also framed in ways that support reflection and strategic decision-making [2]. Opportunities for autonomy arise when learners can regulate pacing and task selection, yet these opportunities depend on how clearly system guidance communicates expectations and progress [7]. Similarly, motivational gains associated with ITSs appear to be influenced by interface responsiveness and feedback tone, suggesting that affective support is embedded within communicative interaction rather than added as a separate component [11]. These communicative and adaptive elements, when combined with learning analytics that provide visibility into learner behaviour for both the system and instructors, create learning environments capable of supporting sustained engagement and differentiated language development [12].

Researchers such as A. Norbert, B. Peña-Acuña and R. C. F. Durão highlight that challenges must be addressed to optimize the integration of these technologies [5], [6]. These include inconsistencies in system design quality, the need for additional training to overcome digital literacy gaps, and the complexity of learners' digital ecologies, where students frequently rely on external tools such as translators and dictionaries [5], [6]. ITSs generate detailed data

on learner behaviour, enabling continuous assessment and refinement of instructional strategies. Learning analytics theory holds that data-driven insights can support personalized feedback, identify learning difficulties, and inform instructional decisions. H. I. Akyüz and M. Erdemir focus on the value of system-generated analytics for understanding learner perceptions and improving instructional design [3]. Similarly, M.-T. Kou, H.-K. Wu, and C.-Y. Hsieh demonstrate how behavioural data from ITS environments reveal differences in learning trajectories across proficiency levels [9]. In language learning, such analytics inform targeted interventions in reading, vocabulary development, and comprehension [12].

Building on these foundations, this study uses a mixed-methods design to examine how learners engage with ITSs as communication technologies. Data are collected from learning analytics and questionnaires. Quantitative data are analysed to identify patterns in engagement and performance, while qualitative data are thematically coded to capture learners' experiences. This approach provides a clear view of ITSs' role in supporting communication, autonomy, and motivation in second language learning.

Communication technologies theory helps explain how learners interpret and respond to automated guidance, while adaptive learning theory clarifies how ITSs tailor instruction to individual needs [13]. Affective computing and learning analytics contribute additional layers that explain motivation, engagement, and instructional decision-making. This integrated framework provides the conceptual basis for examining how learners experience the communicative and adaptive features of ITSs in second language learning contexts [14].

Overall, ITSs and communication technologies hold substantial promise for advancing second language learning. Their combined capacity for adaptivity, communicative mediation, and autonomy-supporting design aligns with current theoretical perspectives in smart learning and provides a foundation for more personalised and interaction-rich learning environments.

## 4 RESULTS AND DISCUSSION

The empirical stage of the research involved 300 undergraduate students from Zhytomyr Polytechnic State University, representing both non-linguistic and linguistic specialities, ensuring a balanced and representative sample. All respondents studied

English as a second language and had prior experience using digital educational platforms, AI tools, or Intelligent Tutoring Systems (ITSs) during their university studies. Participation in the survey was voluntary and anonymous, enhancing the reliability of responses and minimizing social desirability bias.

The research instrument consisted of a structured questionnaire divided into two parts, each containing 15 questions. The first part assessed the frequency with which students used ITSs or AI-based tools to develop different language skills and their perceived effectiveness in communicative contexts. The second part focused on students' perceptions of ITSs as communication technologies, addressing three key dimensions: (1) communicative interaction and language skill development, (2) adaptivity, usability, and learning strategies, and (3) overall perceived effectiveness of ITSs in supporting English language learning. Responses were collected using Likert-type scales, which enabled quantitative analysis, while open-ended questions provided qualitative insights into learner experiences.

Data analysis employed both descriptive and inferential methods. The first part of the questionnaire examined how frequently students used ITSs or AI-based tools to develop different language skills and how effective they perceived these tools to be in communicative contexts. The results demonstrate that ITSs are most actively used for receptive skills and controlled productive practice, while more complex communicative skills

demonstrated moderate but consistent engagement (Table 1).

A substantial proportion of respondents reported frequent use of ITSs for listening and reading practice. Speaking and writing activities facilitated by ITSs were also prevalent, although to a slightly lesser extent. Importantly, students associated ITS use with improvements in pronunciation, fluency, and confidence in real-life communication situations.

The data indicate that ITSs function not only as instructional tools but also as communicative mediators that simulate interaction, provide structured dialogue practice, and support the gradual development of communicative competence. Students particularly valued opportunities to rehearse responses, repeat exercises, and receive immediate feedback in a low-anxiety environment.

The second part of the questionnaire focused on the adaptive and strategic dimensions of ITS use. The findings reveal that students clearly recognize the value of personalization and system responsiveness, although the degree of perceived adaptivity varies (Table 2).

Most respondents agreed that ITSs adjust tasks according to their proficiency level at least occasionally. Personalized feedback was evaluated as one of the most useful features, especially for grammar, vocabulary, and writing tasks. Ease of navigation and clarity of interface were also rated positively, indicating that usability does not present a major barrier to adoption.

Table 1: Use of ITSs for communicative interaction and language skill development.

Survey issues	Results and outcomes
Practising speaking English using ITSs	6% of respondents never practise speaking with ITSs, 18% rarely, 38% sometimes, and 38% often, indicating that more than three-quarters of students regularly engage in ITS-supported speaking practice.
Listening to English audio or dialogues	Only 4% never use ITSs for listening activities, while 16% rarely, 26% sometimes, and 54% often listen to English audio with ITS support, demonstrating strong reliance on ITSs for receptive listening skills.
Reading English texts with ITSs	The majority of students use ITSs for reading: 3% never, 11% rarely, 34% sometimes, and 52% often, showing that ITSs are widely perceived as effective tools for reading comprehension.
Writing support through ITSs	Writing assistance via ITSs is used by 39% of students often and 37% sometimes, while 19% rarely and 5% never rely on such tools, reflecting moderate-to-high integration of ITSs in writing practice.
Pronunciation improvement	7% report no improvement, 27% note slight improvement, 41% report noticeable improvement, and 25% indicate significant improvement, suggesting a generally positive perceived impact of ITSs on pronunciation.
Understanding spoken English in real-life situations	6% of respondents report no effect, 31% a slight effect, 38% a moderate effect, and 25% a strong effect, indicating that ITSs moderately support real-life listening comprehension.
Overall fluency development	6% perceive no improvement, 25% slight improvement, 44% moderate improvement, and 25% strong improvement in fluency, confirming the role of ITSs in enhancing communicative competence.

Regarding learning strategies, many students reported combining ITS practice with traditional resources such as textbooks, teacher feedback, and peer discussions. At the same time, a considerable number of respondents indicated that they critically evaluate system feedback, which suggests an active rather than passive role in learner–system communication.

An important aspect of the study was to determine whether ITSs support learner autonomy and strategic decision-making in language learning. The results show that ITSs are perceived as tools that encourage independent practice while still providing structured guidance (Table 3).

When asked about preferred improvements, the majority of respondents selected comprehensive options, emphasizing the need for more personalized exercises, higher-quality feedback for speaking and writing, and more interactive conversational practice. This finding highlights students’ expectations of ITSs as dynamic communication technologies rather than static exercise generators.

These results suggest that ITSs support autonomy primarily through flexible pacing, repeated practice, and immediate feedback, while their communicative potential could be further enhanced by expanding interactive and dialogic features.

Table 2: Perceived adaptivity, usability, and strategic support of ITSs.

Survey issues	Results and analyses
Adaptation of exercises to the learner's level	5% of students report no adaptation, 24% rarely experience adaptivity, 41% sometimes, and 30% often observe task adjustment, indicating moderate but inconsistent personalization.
Usefulness of personalized feedback	Personalized feedback is viewed positively: 5% find it not helpful, 19% slightly helpful, 41% somewhat helpful, and 35% very helpful, highlighting its central role in learner–system communication.
Ease of navigation of ITS platforms	Only 3% find navigation very difficult and 15% difficult, while 48% consider it easy and 34% very easy, suggesting high usability of ITS interfaces.
Identification of weak language skills	ITSs help identify problematic skills for 74% of respondents (39% sometimes, 35% often), whereas 26% rarely or never receive such diagnostic support.
Planning and organization of learning	8% never use ITSs for planning, 20% rarely, 36% sometimes, and 36% often, demonstrating that ITSs contribute to self-regulated learning practices.
Use of ITSs outside the classroom	A large proportion of students (77%) use ITSs beyond class time (33% sometimes, 44% often), confirming their role in extending learning beyond formal instruction.
Speed of error correction	6% never experience faster correction, 25% rarely, 37% sometimes, and 32% often, indicating that ITSs moderately accelerate feedback cycles compared to traditional methods.

Table 3: Learner autonomy, communicative value, and perceived effectiveness of ITSs.

Survey issues	Results and analyses
Reliance on ITSs for practising difficult language skills	Only 6% of respondents never rely on ITSs when practising difficult skills, while 21% do so rarely. A majority of students (38%) sometimes and 35% often use ITSs for challenging aspects of language learning, indicating a substantial level of trust in ITSs as supportive learning tools.
Encouragement to use diverse learning strategies	7% of students report that ITSs never encourage strategic variation, and 21% rarely experience such encouragement. At the same time, 37% sometimes and 35% often experiment with different learning strategies (e.g., repetition, summarising, reformulation) when guided by ITSs.
Usefulness of ITSs for paired or group learning	11% of respondents never use ITS for collaborative learning and 22% rarely do so. However, 39% sometimes and 28% often employ ITSs in paired or group activities, suggesting moderate integration of ITSs into collaborative communicative practices.
Preference for independent learning supported by ITSs	A small proportion of students (5%) strongly disagree and 21% disagree that they prefer independent learning with ITS support. In contrast, 46% agree and 28% strongly agree, confirming a clear tendency towards autonomous learning mediated by intelligent systems.
Contribution of ITSs to overall learning effectiveness	6% of respondents perceive no contribution of ITSs to learning outcomes, while 19% report a slight contribution. The majority identify moderate (44%) or strong (31%) improvements, highlighting the perceived effectiveness of ITSs in enhancing language learning efficiency.
Desired improvements in ITS functionality	When asked about system improvements, 21% of students prioritised more personalised exercises, 26% requested better feedback for speaking and writing, 18% emphasised the need for more interactive conversational practice, and 35% selected all suggested options, reflecting high expectations regarding communicative and adaptive system features.

To ensure the reliability of the questionnaire, Cronbach's alpha coefficient was calculated to assess the internal consistency of the instrument. The questionnaire items were grouped into three scales corresponding to the conceptual dimensions of the study: (1) communicative interaction and language skill development, (2) adaptivity and usability, and (3) perceived instructional effectiveness.

For each scale, Cronbach's alpha was computed based on respondents' Likert-scale answers to determine the degree to which the items consistently measured the same underlying construct. The obtained values ( $\alpha \geq 0.70$ ) indicated acceptable to good internal consistency across all scales.

Overall, the results confirm that Intelligent Tutoring Systems function as effective communication technologies in second language learning. Students actively use ITSs to practice core language skills, perceive clear benefits for fluency and confidence, and value adaptive feedback mechanisms. At the same time, the findings reveal a need for more advanced communicative scenarios, especially for speaking and writing, to better reflect authentic language use.

The quantitative data obtained from the respondents provide empirical support for viewing ITSs not only as adaptive instructional systems but also as communicative environments that mediate interaction, support learner autonomy, and contribute to sustained engagement in second language learning.

## 5 CONCLUSIONS

The present study demonstrates that Intelligent Tutoring Systems occupy a distinctive position within contemporary second language learning environments, operating at the intersection of adaptive instruction and digitally mediated communication. Rather than functioning solely as delivery mechanisms for linguistic content, ITSs structure the conditions under which learners interact with language through system-guided prompts, adaptive feedback, and iterative task design. These interactional mechanisms enable sustained language practice in a low-anxiety learning environment while dynamically aligning instructional input with learners' developing proficiency levels. As a result, they support the gradual and systematic development of both receptive and productive language skills.

Empirical evidence indicates that students consistently incorporate ITSs into both formal instruction and independent learning activities, particularly for listening, reading, and structured

speaking and writing practice. Learners' reported gains in fluency, pronunciation, and communicative confidence suggest that ITS-mediated interaction contributes meaningfully to communicative competence. At the same time, usage patterns indicate that more complex forms of interaction remain partially limited, which positions intelligent tutoring systems primarily as supportive scaffolding tools rather than as substitutes for authentic communicative interaction with human interlocutors. The findings also emphasize the role of ITSs in shaping learner autonomy and self-regulated learning behaviour. Features such as flexible pacing, individualized task pathways, and continuous feedback encourage learners to assume greater responsibility for planning and monitoring their progress. Importantly, learner engagement with ITSs is characterized by strategic selectivity: students frequently combine system feedback with teacher input, peer collaboration, and external digital resources. This behaviour reflects the complexity of learners' digital learning ecologies and highlights the importance of coherent instructional integration rather than isolated technological adoption.

From the perspective of communication technologies, the educational effectiveness of ITSs emerges from the dynamic interplay between adaptivity and communicative design. Motivation and sustained engagement are not separate system functions but are embedded within ongoing learner-system interaction shaped by feedback framing, interface clarity, and transparency of progress indicators. While the results confirm the overall instructional value of ITSs, they also highlight limitations in dialogic depth, particularly in speaking and writing activities, where learners express a clear demand for richer conversational and interactional formats. The learners' articulated expectations for more individualized tasks and richer conversational formats point to key directions for future system enhancement.

Collectively, Intelligent Tutoring Systems are viewed as communicatively oriented learning environments that mediate interaction, foster learner autonomy, and sustain engagement in second language acquisition. Practical recommendations include integrating ITSs as complementary tools in classroom instruction, guiding students to combine system feedback with teacher and peer support, and gradually developing complex speaking and writing skills. For ITS developers, enhancements should focus on richer interaction, realistic conversational scenarios, adaptive feedback for open-ended tasks, and personalized learning paths. Hybrid models that

combine ITS-mediated learning with teacher- and peer-facilitated activities can further foster learner autonomy, communicative competence, and engagement. Future development of ITSs in language education should focus on enhancing interactive and dialogic functionalities, including more realistic conversational scenarios, improved feedback for open-ended speaking and writing tasks, and deeper personalization based on learner profiles. Further research may also explore hybrid models that integrate ITSs with peer and teacher-mediated interaction, as well as studies examining the long-term impact of ITSs on communicative competence and strategic language use.

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