

Student-Chatbot Interaction: A Lever for Developing Communication Skills in Smart City Schools

Jaouad Ouahbi¹ Yassin Razkaoui²

Science Step Journal / SSJ

2026/Volume 4 - Issue 14

To cite this article: Ouahbi, J., & Razkaoui, Y. (2026). Student-Chatbot Interaction: A Lever for Developing Communication Skills in Smart City Schools. Science Step Journal, 4(14). ISSN: 3009-500X.

<https://doi.org/10.5281/zenodo.22115485>

Abstract

In the age of smart cities, education has become part of a connected urban ecosystem. Within this context, AI-powered conversational agents, or chatbots, are emerging as valuable allies in helping students develop their communication skills. By interacting with chatbots, learners step into a learning environment that is personalized, interactive, and secure. This space lets them practice continuously, receive instant feedback, and build confidence in their ability to communicate, while complementing the essential role of the teacher. Rooted in theories of interactionism, communicative competence, and augmented pedagogy, this approach not only strengthens students' linguistic and pragmatic skills but also nurtures their active participation and sense of communicative citizenship. At the same time, it raises crucial questions about ethics and digital inclusion—issues that must be carefully addressed to ensure education remains both responsible and equitable.

Keywords: Smart education, Chatbot, communication skills

¹ Laboratory of Society, Communication and Discourse Rhetoric, Abdelmalek Essaâdi University, Faculty of Letters and Social Sciences, Tetouan, Morocco

ORCID: 0009-0006-3914-3406

Email: jaouad.ouahbi@etu.uae.ac.ma / ouahbijaouad@etu.uae.ac.ma

² Laboratory of Society, Communication and Discourse Rhetoric, Abdelmalek Essaâdi University, Faculty of Sciences and Techniques, Tangier, Morocco

ORCID: 0009-0006-4435-8989

Email: y.razkaoui@uae.ac.ma

1. Introduction

In a smart city, education is no longer confined to the walls of a classroom. It stretches into digital libraries, collaborative platforms, and interactive public spaces. Students move through an environment where every encounter, whether online or in the city itself, carries the potential to teach, inspire, and transform. The city is no longer just a network of streets, buildings, and infrastructure; it has become a living, connected ecosystem where data, technology, and people converge to shape a more sustainable and inclusive future.

Within this evolving landscape, the school must reinvent its role. Once seen primarily as a place to transmit knowledge and prepare citizens, it is now called to embrace emerging technologies. Doing so not only expands access to learning but also cultivates vital social and communication skills.

Among these technologies, the rapid growth of artificial intelligence, especially conversational agents, or chatbots, has opened new horizons for education. These tools are far more than technical novelties. As virtual tutors, they are always present, adaptive, customizable, and responsive to the diverse needs of learners. Where traditional teaching is often constrained by time, teacher availability, or student diversity, chatbots create interactive, personalized spaces for practice and dialogue. In this way, they become powerful partners in strengthening communication skills, whether linguistic, intercultural, or digital.

This paper explores how student–chatbot interaction, in the context of smart city schools, can support the development of communicative competence. At the same time, it asks how chatbots might be better designed to complement rather than replace teachers, how they can be adapted to different cultural and linguistic settings, and how education can prepare learners to engage with them critically and responsibly as part of their digital citizenship.

2. Conceptual and Theoretical Framework

Studying how students interact with chatbots in the context of smart cities first requires clarifying some key ideas. The concept of the smart city has taken shape over the past two decades as a new way of thinking about urban life—using digital technologies to improve infrastructure and enhance citizens’ quality of life. But a smart city is not just a technological space. It is better understood as a socio-technical ecosystem, where innovation serves people. From this angle, education becomes a central pillar: a city can only be considered truly “smart” if it enables its citizens to grow, communicate effectively, and take part in civic life.

Among the skills required for this, communicative competence plays a strategic role. First defined by Hymes (1972) and later expanded by Canale and Swain (1980), it goes beyond simply knowing a language. It is the ability to use language appropriately in diverse social and cultural contexts.

This competence has several dimensions: linguistic (knowledge of structures), sociolinguistic (adapting to social norms), pragmatic (choosing relevant speech acts), and strategic (overcoming communication barriers). In smart cities, where interactions increasingly combine face-to-face exchanges, screen-mediated communication, and dialogue with artificial agents, this competence becomes indispensable.

This is where AI-powered conversational agents, more commonly called chatbots, come in. Built on natural language processing and machine learning, these systems are designed to interact fluidly and adaptively with users. In education, they stand apart from traditional tutorial software thanks to their interactive and dialogic nature. They don't just deliver information; they simulate real conversation, creating learning conditions closer to human interaction. Their educational potential aligns with interactionist theories of learning, which view communication as a key driver of cognitive and linguistic development (Vygotsky, 1978).

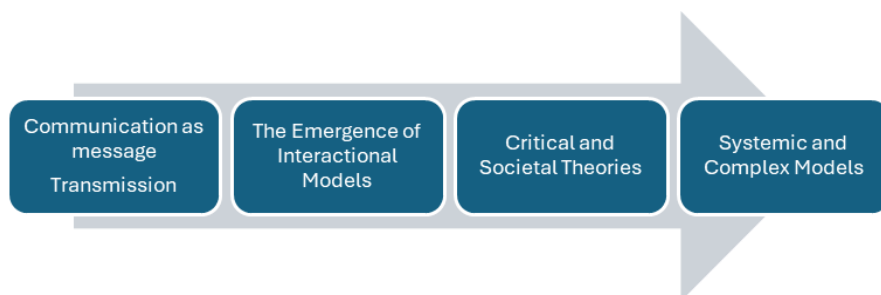


Fig. 1. Evolution of communication models

3. Student-Chatbot Interaction as a Pedagogical Lever

Integrating AI-powered conversational agents into education opens new avenues for teaching and learning. Unlike traditional methods, which often rely on one-way transmission of knowledge, student-chatbot interaction puts learners in an active role. Through ongoing, contextualized, and adaptive exchanges, students build their communication skills more dynamically and interactively.

3.1 Immediate and Continuous Feedback

One of the main advantages of chatbots is their ability to offer immediate and continuous feedback. In the classroom, students often have limited time to speak, but with a chatbot they can practice without restriction. They might, for instance, rehearse asking questions, building arguments, or telling stories, while receiving instant corrections on vocabulary, grammar, or overall coherence. This process reflects the interactionist approach to language learning, which highlights the role of comprehensible input (Krashen, 1982) and learner output (Swain, 1995) in developing both linguistic and communicative skills.

3.2 Self and Continuous Learning

Today, chatbots play a major role in self-learning and continuous learning, becoming learning companions available at all hours. Thanks to their interactivity and adaptability, they offer students instant access to personalized content, tailored explanations, and practical exercises. In the context of self-learning, they promote autonomy by allowing everyone to progress at their own pace, ask questions freely, and receive immediate feedback. For continuous learning, they constitute a flexible tool that supports professionals in updating their skills by integrating new knowledge directly into their daily practice. Thus, chatbots are not limited to transmitting knowledge: they establish an interactive, continuous, and evolving learning environment that makes the act of learning a living, accessible, and sustainable process.

3.3 Personalization of Learning

A second advantage of chatbots lies in their ability to personalize learning. Using AI algorithms, they can adapt to the level of language, the difficulty of tasks, or even the length of interactions to match each student's profile. This tailored approach helps boost motivation, as learners feel their individuality is recognized. While a teacher must balance the needs of an entire class, the chatbot can provide individualized support, encouraging greater engagement and autonomy.

However, personalization must go beyond simply adjusting content to a learner's pace. It should also ensure fairness of access, transparency in data use, and protection of privacy. By embedding ethical safeguards into their design—such as neutral responses, sensitivity to local contexts, and accessibility for vulnerable groups—chatbots can support education in a way that is both personalized and aligned with the principles of inclusion.

3.4 An assistant and a complement to the teacher

Chatbots cannot replace teachers; rather, they are considered a complement to the teacher's role by strengthening students' communicative practice beyond the classroom. They always provide an interactive space where learners can practice oral expression, receive immediate feedback, and build confidence in their language use. These conversational agents act as complementary pedagogical tools, multiplying practice opportunities. The teacher retains their central role as mediator, critical guide, and guarantor of learning quality, while the chatbot becomes a technological partner that enriches the educational experience.

4. Case Studies and Experiments

To measure the impact of student-chatbot interaction on communication skills, I carried out an experimental study with 2nd-year middle school students in a private institution. The sample

included 60 students, divided into two groups: an experimental group that regularly used ChatGPT for oral exercises, and a control group that followed traditional teaching without a chatbot. The program ran for six weeks, with activities focused on oral and intercultural communication. Student progress was assessed through evaluations conducted before and after the intervention.

The findings show that the experimental group made significant gains in their communication skills compared to the control group. Students who practiced with the chatbot demonstrated greater oral fluency, richer vocabulary use, and increased confidence in their interactions. The qualitative data also revealed stronger engagement, higher motivation, and reduced anxiety around speaking in public. Together, these results highlight the potential of chatbots as powerful educational tools for enhancing communicative competence, while offering learners a more individualized and secure learning experience.

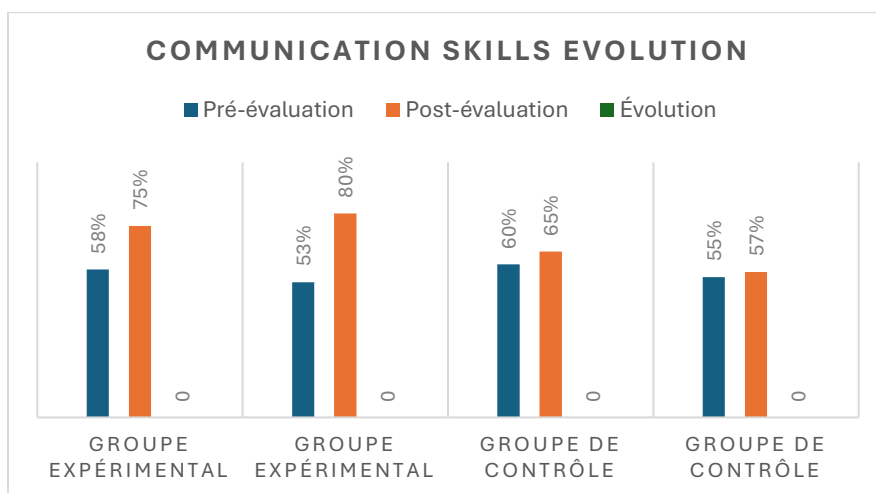


Fig. 2. Comparison of Communication skills evolution

5. Recommendations for Improving the System

The student experiment–chatbot interaction for developing communication skills also revealed certain limitations and challenges. Some constraints and adaptation difficulties were observed, which may lessen the tool’s overall effectiveness in supporting learning. These findings point to the importance of identifying learners’ specific needs and putting in place targeted improvements to optimize the system’s impact.

5.1 The Need for a Personalized Educational Chatbot

One of the key conclusions of this study is the central role of personalization in the learning process. Every student has their own rhythm, language level, and specific needs, all of which must be considered to maximize the effectiveness of teaching. This points to the value of designing an educational chatbot that can tailor its responses and activities to each learner's profile while remaining aligned with the school curriculum. The personalization of chatbots must also be approached with great care to respect both ethics and privacy. To balance innovation with responsibility, chatbots should be designed with strict data protection measures, transparency in how information is used, and options that give learners control over their personal data. This ensures that personalization serves educational goals without sacrificing ethical principles or the right to privacy.

5.2 The Need for Cultural and Linguistic Contextualization

For the interaction to be truly relevant, the chatbot must integrate a cultural and linguistic dimension adapted to the students' context. References, examples, phrases, and even humor must correspond to local cultural realities to make communication more natural and meaningful. This contextualization not only facilitates understanding but also makes students aware of intercultural nuances and strengthens pragmatic and sociolinguistic learning, which are key elements of communicative competence.

5.3 The Need to Create a Specifically Moroccan Chatbot

Finally, to foster student engagement and align with the needs of the local educational system, it is recommended to develop a chatbot specifically designed for Morocco. Creating a Moroccan chatbot directly supports national sovereignty in technology and digital education. By developing a locally designed tool, Morocco can maintain control over the data generated through student interactions, ensuring the security and confidentiality of sensitive information while reducing reliance on foreign solutions. Such a chatbot also promotes technological and pedagogical autonomy, as its content, algorithms, and updates can be managed and adapted by national experts to reflect the country's cultural and linguistic context. In this way, a Moroccan chatbot is more than an innovative educational tool—it becomes a strategic instrument for digital independence, safeguarding citizens' data, enhancing local expertise in smart technologies, and reinforcing cultural and educational sovereignty within the smart city ecosystem.

6. Conclusion

Finally, the prospects offered by this integration are both rich and inspiring. Smart city schools can become laboratories for innovative pedagogical practices where AI, communication, and civic

engagement converge to nurture competent, autonomous, and responsible learners. Future research should further explore the impact of these interactions on communication skills, examine the ethical and technological challenges involved, and propose models for the co-creation of knowledge between humans and intelligent agents. In short, student-chatbot interaction is more than just a tool: it is a powerful vector for educational and social transformation, essential for preparing the citizens of tomorrow to live and thrive in smart, connected cities.

References

1. Bruner, J. S. (1983). *Child's talk: Learning to use language*. New York, NY: Norton.
2. Canale, M., & Swain, M. (1980). Theoretical bases of communicative approaches to second language teaching and testing. *Applied Linguistics*,
3. Hymes, D. H. (1972). On communicative competence. In J. B. Pride & J. Holmes (Eds.), *Sociolinguistics* (pp. 269–293). Harmondsworth, UK: Penguin.
4. Kim, Y., & Kang, E. (2021). Chatbot-assisted language learning: Effects on EFL learners' speaking proficiency and communication confidence. *Computer Assisted Language Learning*, 34(5–6), 624–648.
5. Krashen, S. D. (1982). *Principles and practice in second language acquisition*. Oxford, UK: Pergamon.
6. Sierra, J., & Muñoz, C. (2022). Conversational agents in higher education: Enhancing student engagement and communication skills. *Interactive Learning Environments*, 30(7), 1034–1050.
7. Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.
8. Woolf, B. P. (2020). *Building intelligent interactive tutors: Student-centered strategies for revolutionizing e-learning*. Burlington, MA: Morgan Kaufmann.
9. Coccoli, M., Pagano, A., & Spinelli, G. (2019). Smart city education: How AI and digital tools can enhance urban learning environments. *Journal of Urban Technology*,
10. Winkler, R., & Söllner, M. (2018). Unleashing the potential of chatbots in education: A research agenda. *Computers & Education*, 122, 157–171.