

Artificial intelligence and inclusive teaching: reflections from the use of a chatbot to support instructional design and teacher professionalism

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Abstract: AI can function as a facilitator and amplifier of teaching practice, enabling pathways of personalization. This contribution examines the role of Artificial Intelligence (AI), offering a reflection on how to design and implement AI technologies that genuinely serve teachers in order to promote a more equitable and inclusive education for all. The analysis presents a pilot study of a chatbot developed by IRCIT and Talent, conceived as an adaptive educational ecosystem that acknowledges the teacher not as a mere content provider but as a facilitator of learning. The tool supports the educational team - both general and special education teachers - in designing and implementing personalized learning pathways, with particular attention to students with disabilities. To evaluate its effectiveness, we defined a methodological framework that shifts the focus from isolated elements to the classroom ecosystem, recognizing inclusion as a multi-level process involving the student with disabilities, peers, and teachers. Drawing on a scoping review, the framework is articulated into key dimensions and investigated through a mixed-methods design, combining quantitative and qualitative data. The aim of the study is to examine whether, and in what ways, a chatbot grounded in explicit pedagogical principles can act as a catalyst for teacher professionalism, influencing self-efficacy, design practices, and role perception.

Keywords: Artificial Intelligence, Research Methodology, Inclusive Education.



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1. Introduction

Designing truly inclusive interventions in heterogeneous classrooms represents one of the most complex challenges of the teaching profession. Ensuring equal learning opportunities, valuing diversity, and responding to a wide range of educational needs require continuous commitment, specific competencies, and constant reflection on both instructional and relational practices. In this context, artificial intelligence (AI) should not be understood as a technocratic solution but rather as a potential strategic partner, provided that its architecture and use are firmly grounded in sound pedagogical principles. From this perspective, AI can become a tool capable of facilitating and enhancing teachers' work, supporting them in the complex process of personalization, and freeing up cognitive and emotional resources to be devoted to the educational relationship.

Inclusion is today conceptualized as a distinctly multidimensional process: social-relational, methodological, organizational, and cultural, that involves the entire

school community. In Italy, this vision has deep historical roots: as early as the 1970s, well before the Salamanca Statement (UNESCO, 1994) and the “Education for All” movement (UNESCO, 2000), school legislation had already introduced the right of access to an education system designed for everyone (Dell’Anna, Pellegrini, 2019). In the literature, this multidimensional perspective has been consolidated through a wide range of studies and critical analyses, which have highlighted how “practicing inclusion” means ensuring equal learning opportunities, fostering collaborative relationships, and providing an educational environment in which every student feels valued and actively engaged.

In recent years, there has been a growing interest in the role of AI within the educational field. Documents such as the Italian Strategy for Artificial Intelligence 2024–2026 and UNESCO’s 2021 guidelines converge on the need to develop reliable systems aimed at ensuring educational equity. The field of Artificial Intelligence in Education (AIED) includes technologies such as chatbots, intelligent virtual assistants, and educational robots, designed to support teaching and learning processes by enabling pathways attentive to individual needs. More than a set of tools, AIED represents a dynamic process capable of redefining pedagogical approaches and instructional models, while maintaining a strong commitment to ethics and human well-being (Bevilacqua, Fiorucci, 2024).

In this context, Artificial Intelligence (AI) emerges as a valuable resource for addressing the limitations of traditional methodologies, offering innovative educational approaches capable of responding more effectively to the complexity and diversity of the classroom microcontext. In particular, the use of AI-based chatbots and virtual assistants represents a concrete opportunity to rethink teaching and learning dynamics from an inclusive perspective, providing personalized and flexible responses to each student’s needs.

Building on these premises, this contribution examines an AI-based chatbot model developed through a collaboration between the International Research Center for Inclusion and Teacher Training (IRCIT) and the Italian company Talent. Conceived not only as a tutor for students with disabilities and for the entire class, the tool was simultaneously designed as a direct support for teachers, assisting them in planning and implementing inclusive educational practices.

2. Architecture of the IRCIT–Talent Chatbot for Inclusive Instructional Design

The IRCIT–Talent chatbot was created with the aim of functioning as an adaptive educational ecosystem that recognizes the teacher not as a mere content provider, but as a facilitator of learning and a “pedagogical director”. Its architecture is not intended to complete tasks in place of the student or to deliver ready-made solutions; on the contrary, it supports and stimulates the learning process through genuinely personalized tutoring, while simultaneously assisting teachers in the design and implementation of tailored instructional pathways, with particular attention to students with disabilities.

This framework is in dialogue with the tradition of Intelligent Tutoring Systems (ITS), developed to simulate forms of one-to-one personalized tutoring. ITS make it possible to monitor student performance and adapt instruction through personalization processes responsive to different learning styles and profiles. Within this framework, AI-based conversational chatbots for educational purposes have emerged

- as indicated by several systematic reviews - among the most effective applications, capable of serving as virtual assistants for both students and teachers (VanLehn, 2011; Labadze, et. al. 2023). The IRCIT–Talent model follows this trajectory while extending its scope, placing stronger emphasis on direct support for teachers’ professional practice from an inclusive perspective.

Through a dedicated interface, the teacher can configure the student’s profile using ICF classification codes, drawn from the Functional Diagnosis or the Functioning Profile. On this basis, the chatbot calibrates its communicative style and modes of interaction - use of images, expressive registers, conceptual types, lexical choices, syntactic structure, and emotional tone - so as to respect the student’s specific functioning (De Mutiis, et. al. 2025).

Moreover, the teacher can employ the chatbot as a creative collaborator to develop educational proposals aimed at inclusion. By entering targeted prompts, the platform does not generate a standardized lesson; rather, it offers a range of innovative ideas and pedagogically grounded methodologies aligned with the student’s individual characteristics.

This functionality is intended, on the one hand, to support teachers’ professional creativity and lighten their workload without replacing their decision-making responsibility; and, on the other, to yield a concrete enhancement of instructional design capacity and an improvement in their sense of self-efficacy.

3. Methodology

Within this conceptual framework, the research questions underpinning the proposed methodology are as follows:

- To what extent can a conversational chatbot be employed as a tool to enhance inclusive dynamics within the classroom microcontext?
- Consequently, how can such a potential increase be observed and “measured” in real educational settings?

In relation to these questions, the subsequent logical steps for identifying possible answers concern:

- the definition of the characteristics of a conversational chatbot specifically designed to influence inclusive dynamics within the classroom microcontext;
- the experimentation of the system in real school settings, in order to assess its potential contribution as a facilitator of inclusivity and instructional design.

To evaluate an intervention of such complexity, it was necessary to construct an appropriate research framework. The methodological challenge lies in overcoming traditional evaluative approaches - often focused on academic performance or technical accessibility - which prove insufficient for capturing the multidimensional nature of inclusion. The proposed model therefore shifts the focus from the analysis of individual elements to the observation of the entire classroom ecosystem, adopting a perspective that recognizes inclusion as a multilayered and multidimensional process involving students with disabilities, their peers, and teachers.

Based on these premises, a scoping review was conducted following the methodological framework of Arksey and O’Malley (2005), with the aim of identifying the dimensions on which to base the evaluation of the inclusiveness level of the support provided by the AI chatbot within the classroom microcontext. The systematic exploration considered national and international scientific articles published over the past decade (2014–2024), encompassing multiple methodological approaches (theo-

retical-argumentative, qualitative, quantitative, systematic reviews, action research, and experimental designs). From this analysis, the following key dimensions of inclusivity emerged - with the most relevant references - (De Mutiis, et. al. 2025):

1. Participation and engagement of the student with disabilities (Kinsella, 2018; Cottini, 2018; Winkler, Roos, 2019)
2. Accessibility and adaptation to the student's individual functioning (Bevilacqua, Fiorucci, 2024; Pascoletti, 2017; Salis, Punzo, 2023; Pagliara et al., 2024)
3. Learning outcomes and academic performance (Chi, Wylie, 2014; Loreman, et. al. 2014; Qvortrup, et. al. 2018)
4. Social climate and peer interaction (Cottini, 2018; Booth, Ainscow, 2014; Antognazza, 2016; Morganti, Bocci, 2017; Ma et al., 2014; Zanon et al., 2024)
5. Motivation and self-regulation in learning (Ma et al., 2014; Zanon et al., 2024)
6. Support for the teaching role in matters of inclusion (Cottini, 2018; Fedeli, Di Barbora, 2023; Refrigeri, Palladino, 2019; Ellerani, Ferrari, 2024)

To investigate the dimensions under study, the methodological design adopts a mixed-methods perspective, integrating quantitative and qualitative methodologies and providing for data collection before, during, and after the experiment. Defining a valid set of indicators - already partially outlined in the scoping review phase - constitutes an indispensable precondition for ensuring the relevance and reliability of the empirical findings.

The final quantitative and qualitative definition of the number and type of indicators was guided by criteria of scientific rigor and operational efficiency, including:

- the identification of already available and validated measurement tools, also in Italian, in order to avoid developing additional instruments from scratch and, consequently, to reduce the time and resources required for ad hoc experimental validation;
- the possibility of extracting objective data both from the information system underlying the chatbot and from the Electronic Register of the schools involved in the trial;
- the use of instruments not subject to formal validation procedures, pertaining to informative or observational reports, that are nonetheless suitable for providing relevant information in terms of data quality.

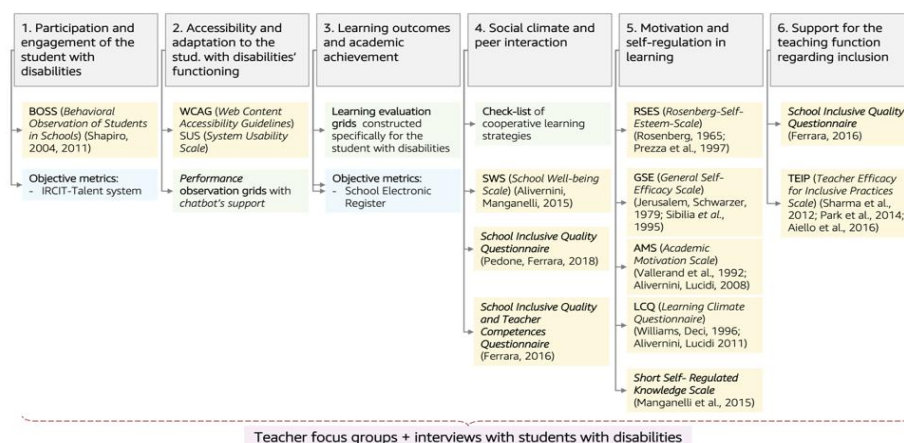
The various quantitative instruments, each linked to the main indicators of the six investigated dimensions of inclusivity, were selected to enable an integrated analysis with qualitative evidence drawn both from the concluding focus group conducted with teachers and from the post-experiment interviews with students with disabilities. This methodological integration aims to highlight the connections among the multiple variables active within the classroom microcontext and the empirically observable contribution of the chatbot's use.

Particular methodological attention is devoted to the dimension of support for the teaching role, considered central to this contribution. This is examined through standardized quantitative instruments such as the Teacher Efficacy for Inclusive Practices Scale - TEIP, Italian version - (Aiello, et. al. 2016) and the Questionnaire on the Inclusive Quality of the School and Teachers' Competences

(Ferrara, 2016), as well as through qualitative instruments, in particular, a final focus group with the teachers participating in the trial.

The following figure illustrates the validated and selected measurement instruments for each dimension of interest.

Figure 1.



Most of the measurement instruments are administered both before and after the trial so that each student can serve as their own control. Exceptions include: the System Usability Scale (SUS), applied only at the end of the experiment; observation grids and evaluation grids completed by teachers, used at multiple time points to monitor accessibility and progress; and the BOSS, administered frequently to capture behaviors across different contexts and support configurations.

The qualitative instruments (focus group and interviews) are used exclusively in the post-experimental phase, with the aim of relating the quantitative data to classroom dynamics and to the perspectives of the actors involved.

The cross-analysis of data collected in the different phases - before, during, and after the introduction of the chatbot - by combining quantitative and qualitative methods aims to provide a nuanced, multi-perspective understanding of inclusive dynamics, highlighting the interaction among individual, relational, and contextual factors. In this light, the final focus group with teachers and the post-experiment interviews with students with disabilities serve as key instruments for connecting the quantitative data with the research questions and for analyzing the chatbot's contribution within the classroom microcontext. Particular emphasis is placed on an in-depth exploration of the teachers' perspective, deemed essential for understanding the complexity and interconnectedness of the variables that characterize the classroom environment from an ecosystemic standpoint.

The research methodology had to contend with the critical issue of being unable to establish a clear distinction between a control group and an experimental group. The high heterogeneity of students with disabilities, due both to the variety of conditions identified by ICF codes and to the wide range of individual factors, makes it impracticable to form statistically homogeneous pairs. Moreover, the highly personalized nature of the chatbot intervention precludes the standardization typical of experimental settings.

In real school contexts, it is also virtually impossible to isolate groups from uncontrolled external variables, such as differences in teachers' practices or interactions among different groups. Therefore, the adopted solution was to administer the same measurement instruments in a pre–post mode to the same participants, so that each individual would serve both as a case and as their own control.

The proposed methodology was applied in a feasibility study launched in March in two upper secondary schools in Arezzo and Velletri¹, involving 12 students with disabilities. The actual trial, lasting three months, is scheduled for the 2026 school year, preceded by two months of preparation.

This timeline proved necessary for several reasons that emerged during the feasibility study. First, school leaders are to receive detailed information about the agreements with IRCIT and Talent, followed by teacher training on the nature of the chatbot, the research objectives, the platform's operational procedures (virtual classes, accounts), and privacy regulations.

Time is also allocated to communicate accessibly with students with disabilities, classes, and families, to obtain informed consent, and to foster teachers' motivation toward collaborative and inclusive planning. Finally, specific training activities are planned regarding the administration of the measurement instruments and the informed use of the chatbot.

4. Results

The findings of the preliminary trial, completed at the end of the last school year, indicate that the action of the IRCIT–Talent chatbot, conceived as a device to enhance inclusive dynamics, operates across three interconnected layers within the classroom microcontext: (a) technical factors intrinsic to the system; (b) individual-level factors (student with disabilities and teacher); and (c) group-level factors (class and teaching team).

On the technical side, the chatbot itself becomes an object of evaluation with respect to its degree of accessibility and adaptation to the functioning of the student with disabilities (Dimension 2). Personalization concerns communicative registers, expressive modes, conceptual types, lexical choices, syntactic structure, and emotional tone.

Individual factor – student perspective, the positive influence unfolds along two lines:

- an increase in active participation in both individual and group activities, with a reduction in passivity and off-task behavior and greater continuity in homework, thanks to improved communicative attunement (Dimension 1);
- a growth in knowledge/skills/competences, reflected in favorable assessment results (Dimension 3).

¹ The institutions that took part in this feasibility study are the “Margaritone Vasari” Institute in Arezzo (<https://www.tecnicoprofessionalearezzo.edu.it>) and the “Tognazzi” Institute in Velletri (RM) (<https://www.alberghierovellettri.edu.it>). We extend our thanks for their interest and professional collaboration in recent weeks to Headmaster Dr. Renzo Izzi and the coordinating teacher Prof. Valentina Vitellio for the Arezzo institute, and to Headmistress Dr. Sandra Tetti and the coordinating teacher Prof. Luisa Mignogna for the Velletri (RM) institute.

These outcomes are accompanied by heightened motivation and self-regulation (Dimension 5), which foster personal well-being and support more confident, sustained interactions with peers (Dimension 4).

Individual factor – teacher perspective, the chatbot contributes by supporting the ideation, design, and implementation of collaborative activities tailored to the functional characteristics of the student with disabilities, lightening teachers' workload and strengthening their sense of instructional self-efficacy (Dimension 6).

Group level, the impact is predominantly indirect, mediated by the student and the teacher: there is greater professional collaboration within the educational team (Dimension 6) and a perceived improvement in the social climate and peer dynamics (Dimension 4). Overall, any inclusive effect of the chatbot should therefore be interpreted by considering the plurality of actors (student with disabilities, class group, teachers) and the multiplicity of activated relationships, both direct and indirect.

The analysis of class-group perceptions shows that the main difficulties do not concern conceptual understanding, but rather transversal competences (time management, retention of what has been studied) and maintaining motivation. Expectations toward an AI tutor like IRCIT–Talent are clear: not a “virtual friend”, but an interlocutor with defined roles, capable of acting either as a teacher who provides step-by-step guidance or as an expert who supplies precise answers. The most valued functions are immediate corrections with detailed explanations and progress monitoring through visual feedback.

The pilot study outlined an initial scenario richer than expected and confirmed the need for instant, personalized support, reinforcing the decision to introduce the chatbot in a guided, pedagogically oriented manner.

A qualitative reading of the final focus group with teachers highlights three elements: (1) recognition of the chatbot as an effective tool for individualization and personalization, which shortens search/simplification time and frees cognitive resources for relationship-building and observation; (2) its role as an “idea generator” for designing innovative, collaborative activities that translate inclusion principles into concrete practices; (3) the need for active involvement of the entire team to avoid episodic initiatives, including a renegotiation of timelines typical of traditional teaching.

Across the board, teachers assert a human, pedagogical governance of the process: the chatbot is useful only as support, not as a guide; instructional strategy, contextual assessment, and educational responsibility remain with the teacher. Hence the need to promote critical AI literacy that makes teachers informed users.

In conclusion, the transformative potential of AI for inclusion does not lie in the replacement or automation of tasks, but in its integration into teachers' workflow as a “partner” capable of enhancing professional expertise, reflective practice, and design capacity. From this perspective, AI becomes an instrument of inclusion only insofar as it strengthens the teacher's “pedagogical intelligence”.

5. Discussion and Conclusions

This study proposes a multidimensional evaluative framework to analyze the impact of an AI chatbot (IRCIT–Talent) as support for instructional design and teacher competence, for the learning of students with disabilities, and, more generally, for the inclusive dynamics of the classroom microcontext.

The framework moves beyond readings focused solely on academic outcomes, adopting an ecosystemic perspective that integrates six dimensions of inclusion with corresponding indicators. A clear strength of the proposed methodology lies in its uniqueness: at present, there are no other studies based on methodologies capable of assessing how a conversational chatbot can contribute to increasing inclusivity in the classroom.

Alongside these strengths, the methodology has limitations that must be considered. The principal challenge, common to much research conducted in real educational settings, concerns causal attribution. Isolating the specific effect of the chatbot from the numerous variables present in the classroom (e.g., teacher style, pre-existing group dynamics, other supports available, etc.) is highly complex. Although a mixed-methods approach, pre-post measurements, and the possibility of applying statistical models such as linear regression help mitigate this limitation, they cannot eliminate it entirely. The generalizability of the results may be constrained by the specificity of the student sample (characterized by high heterogeneity), the school context, and the particular AI tool employed.

The results obtained and the difficulties encountered open important avenues for future research, highlighting the need to examine more closely the mechanisms through which artificial intelligence may promote (or fail to promote) inclusion. It is essential to investigate which specific functionalities of an AI chatbot are most effective and how these features interact with students' individual characteristics and teachers' instructional practices. Longitudinal studies could offer deeper insight into the long-term effects of AI use on students' autonomy and life trajectories.

Moreover, it is crucial to develop methodologies that amplify the voices of students with disabilities, making them active participants in evaluating the technologies designed for them. Although the introduction of AI into inclusive education, through chatbots, offers promising prospects, its evaluation requires complex and rigorous methodological approaches like the one presented here. Addressing limitations and ethical challenges transparently is essential to guide the future development of technologies that are genuinely effective, equitable, and at the service of inclusion.

The value of AI does not lie in replacing the teacher, but in its ability to enhance instructional design, reflective practice, and inclusive action, thereby contributing to a more equitable and participatory education.

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