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Artificial Intelligence as a Tool for Inclusive Educational Planning: Case Studies from Residential Childcare

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Abstract: Educational work in residential childcare unfolds in environments marked by instability, diverse life histories of children, and the need to balance educational aims with everyday caregiving responsibilities. Professionals in these settings must translate heterogeneous sources of information into meaningful educational and developmental activities. Institutional rules, cultural and linguistic contexts, health-related constraints, and disrupted educational trajectories often intersect in ways that require continuous interpretation and adaptation. Artificial intelligence has recently attracted attention as a tool capable of assisting educators in organising complex information and supporting the preparation of individualised activities. This qualitative study employs a multiple case study design examining practical interactions between educators and an AI-based conversational system during educational planning in residential childcare. The analysis draws on several practice-oriented cases reflecting different developmental and social contexts, including cultural diversity, gender identity sensitivity, health-related dietary restrictions, and situations involving children without significant developmental difficulties. In these cases, AI-assisted tools were used to support tasks such as language mediation, interpretation of cultural frameworks, identification of potential tensions between institutional expectations and children's backgrounds, and the preparation of structured educational activities. The findings suggest that artificial intelligence can assist educators in synthesising contextual information and structuring pedagogical planning in demanding institutional environments. When used within clear professional and ethical boundaries, AI may strengthen the capacity of educators to respond to the diverse needs of children exposed to risks of social exclusion.

Keywords: artificial intelligence; inclusive education; residential childcare; social exclusion; educational planning; case study

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1. Introduction

Artificial intelligence is increasingly discussed as a transformative force in education, yet its role in residential childcare remains largely unexplored. Educational work in residential childcare unfolds under conditions that differ substantially from those typically assumed in research on artificial intelligence (AI) in education. Much of the existing literature has been developed within the context of formal schooling or higher education, where learning processes take place in relatively stable institutional environments supported by clearly defined curricular frameworks (Chen et al., 2020; Wang et al., 2024). In such settings, educational interventions are typically organised around predictable instructional structures and continuous teacher–student interaction. Residential childcare, by contrast, combines educational, social, and caregiving responsibilities in environments where children’s developmental trajectories are frequently shaped by experiences of instability, disrupted schooling, or social disadvantage.

Children growing up in residential childcare often encounter barriers that extend beyond academic performance alone. These may include interrupted educational pathways, cultural and linguistic differences, health-related limitations, and difficulties associated with identity formation or social belonging. As a consequence, educational support in residential childcare cannot rely solely on standardised instructional models. Educators must instead translate diverse and sometimes conflicting sources of information into meaningful activities that support both learning and personal development. This process requires continuous interpretation of the child’s situation in relation to institutional expectations, school requirements, and everyday routines within the residential environment.

The complexity of this work places considerable cognitive and organisational demands on professionals. Educational planning frequently requires the integration of heterogeneous sources of information, including institutional regulations, individual educational plans, health considerations, cultural frameworks, and the practical constraints of everyday life in residential childcare. These demands are intensified by the limited time available for preparation and by the need to coordinate activities across changing caregiving shifts and institutional routines. In this context, educators must combine pedagogical knowledge with contextual sensitivity and practical judgement.

Recent developments in AI have introduced new possibilities for supporting professionals confronted with such complexity. Advances in machine learning and large language models have demonstrated an increasing capacity to synthesise large volumes of textual information, identify patterns across heterogeneous sources, and assist users in structuring complex tasks (Memarian & Doleck, 2023). In educational contexts, AI has been explored as a tool for personalised learning, adaptive instruction, and differentiated educational support (Li et al., 2025). These developments have stimulated growing interest in the role of AI in inclusive education, particularly in situations where learners face barriers associated with disability, language differences, or socio-economic disadvantage (Hussein et al., 2025; Roshanaei et al., 2023).

Despite these advances, empirical research focusing on the use of AI in residential childcare remains limited. Most studies addressing AI in education concentrate on school-based environments or digital learning platforms, while institutional care settings receive comparatively little attention. At the same time, research on digital tools in residential childcare highlights the importance of technologies that support the organisation of complex information and the preservation of children’s personal narratives within institutional contexts (Lucas et al., 2024). These findings suggest that technologies capable of synthesising diverse information sources may have particular relevance for educational work in residential childcare.

The use of AI in sensitive social contexts also raises important ethical considerations. Global discussions on the governance of AI emphasise principles such as transparency, accountability, and human oversight as essential safeguards when digital technologies are introduced into environments involving vulnerable populations (Jobin et al., 2019). In educational and care settings, these principles imply that AI should function as a supportive analytical tool rather than as an autonomous

decision-making system. Professional judgement, contextual understanding, and responsibility for educational decisions must remain firmly within the domain of human practitioners.

Against this background, the present study examines the potential of AI as a supportive instrument for inclusive educational planning in residential childcare. The aim of this study is to explore how accessible AI tools may support educators working in residential childcare when preparing educational activities and responding to complex contextual situations involving children at risk of social exclusion. The article draws on several qualitative case studies that illustrate how educators may use AI-assisted tools when planning educational and developmental activities for children with diverse developmental and social contexts. The analysis focuses on situations involving cultural and linguistic diversity, identity-sensitive contexts, health-related limitations, and standard educational support. By examining these cases, the study seeks to explore how AI may assist professionals in organising complex contextual information and preparing educational activities that respond to the needs of children exposed to risks of social exclusion.

2. Literature Review

The growing integration of AI into educational contexts has generated a substantial body of research examining its pedagogical, technological, and ethical implications. Scholars increasingly emphasise the potential of AI-based systems to support personalised learning, differentiated instruction, and improved accessibility for learners facing diverse educational barriers. At the same time, the literature highlights important limitations, particularly the lack of empirical evidence from complex educational environments where learning is closely intertwined with social care and institutional constraints. Residential childcare represents one such context. For this reason, a review of the existing literature is necessary in order to situate the present study within current debates on AI in education, inclusive educational practice, and the responsible use of AI in environments involving vulnerable children.

2.1. AI in Education as a Research Field

Research on AI in education has developed from early work focused on intelligent tutoring, automation, and learning analytics to a broader agenda that includes teacher-facing support for planning, feedback, and instructional design (Chen et al., 2020; Wang et al., 2024). Systematic syntheses indicate substantial growth in empirical studies, yet they also underline persistent fragmentation across methods, settings, and outcome measures, which complicates the interpretation of effectiveness claims (Urmeneta & Romero, 2024). A recurrent concern is that educational practice is often treated as a downstream site of implementation, while educators' situated judgement and organisational constraints receive less analytical attention (Zawacki-Richter et al., 2019). This observation is particularly relevant for the present study because residential childcare is defined by institutional constraints, discontinuity, and competing care responsibilities that shape what educational planning can realistically achieve.

2.2. AI for Inclusion, Equity, and Differentiated Educational Support

Within inclusive education, AI is frequently positioned as a mechanism for differentiation, accessibility, and support for learners facing barriers linked to disability, language, or socio-economic disadvantage (Damyanov, 2024; Roshanaei et al., 2023). Reviews focusing on special education report a wide range of proposed applications, including assistive technologies, adaptive content, and tools aimed at improving participation, although the evidence base remains uneven, often relying on small samples and limited reporting of implementation conditions (Hussein et al., 2025). Systematic reviews in inclusive education similarly note that many empirical contributions foreground technical capability while providing less detail on pedagogical integration, professional decision-making, and the relational dimensions of inclusive practice (Li et al., 2025). Conceptual and policy-oriented work also emphasises the need to address language barriers and

broader participation constraints, yet translation into sustained everyday practice remains limited (Fitas, 2025; Mpu, 2024).

This literature supports an important premise for residential childcare: the central challenge lies not only in access to educational resources but in the professional capacity to organise meaningful activities under complex institutional constraints. Emerging work has already explored participatory approaches to the use of AI with vulnerable children (Daněk et al., 2025). The present study extends this line of research by focusing specifically on the role of AI as a practical support tool for educators working in residential childcare. In this context, inclusion cannot be reduced to access to content or the adaptation of tasks within a stable classroom routine. Instead, inclusion is enacted through feasible activities that can be sustained across shifts, aligned with institutional rules, and responsive to children's changing needs. The relevant question therefore concerns not only whether AI can personalise instruction, but whether it can support the planning work through which inclusive activity becomes possible.

2.3. Generative AI and Large Language Models in Educational Practice

The emergence of large language models has intensified interest in AI systems capable of operating through natural language to support drafting, summarisation, explanation, and dialogue. Foundational work on emergent abilities suggests that performance improvements can yield qualitatively new capabilities, including the synthesis of heterogeneous textual sources into coherent representations, a capacity directly relevant for planning tasks that require integrating multiple documents and contextual constraints. Research on generative AI in education commonly highlights opportunities for scaffolding writing, generating feedback, supporting tutoring, and facilitating communication-focused learning, while also emphasising risks related to reliability, bias, and uncritical reliance on automated outputs (Al Afnan et al., 2023; Memarian & Doleck, 2023; Rejeb et al., 2024; Bargavi & Jucunda, 2025). Studies examining the educational use of AI chatbots indicate that their perceived usefulness depends largely on how tasks are framed and on the pedagogical intentions guiding their use, not simply on the fluency of the interaction itself (Bekeš & Galzina, 2023).

Empirical research on AI-mediated interaction suggests that these technologies may reshape learner–educator relationships by redistributing cognitive and organisational demands (Seo et al., 2021). Comparative analyses of generative artificial intelligence systems used in educational assessment highlight substantial variability across models and tasks and underline the necessity of human oversight, clearly defined constraints, and transparency regarding system limitations (Milakis et al., 2024). In residential childcare, these considerations are particularly important because educational planning takes place within relationships of trust and safeguarding responsibility.

2.4. Residential Care and Childcare as Distinct Implementation Contexts for AI

A significant limitation of current AI research is the scarcity of studies situated in child welfare and residential childcare contexts. Research on AI in nonprofit and care services often prioritises coordination, service optimisation, or administrative efficiency, while educational planning receives comparatively little attention (Panigrahy, 2025). Evidence from medical informatics demonstrates that administrative data in residential care settings can be used for risk identification, illustrating both the feasibility of AI use in institutional environments and the importance of cautious interpretation of algorithmic outputs (Ambagtsheer et al., 2020). At the same time, research on digital practices in residential childcare shows that technologies influence how children's histories and identities are documented and preserved, raising questions of responsibility and governance that extend beyond technical performance (Lucas et al., 2024). Earlier research on identity maintenance in childhood environments further highlights the importance of everyday practices that support continuity of self, an issue that becomes particularly salient in out-of-home care (Brooker, 2006).

2.5. Responsible Implementation and Ethical Governance in Childcare and Education

Ethical governance represents a central dimension of AI deployment in contexts involving vulnerable children. Analyses of global AI ethics guidelines reveal strong convergence around principles such as transparency, accountability, fairness, privacy, and human oversight (Jobin et al., 2019). Educational ethics research similarly emphasises that trust in AI-supported systems depends on their alignment with accountable pedagogical processes and the preservation of professional responsibility (Holmes et al., 2023). Recent scholarship focusing specifically on childcare highlights responsible implementation as a practical challenge that requires operational safeguards, role clarity, and attention to developmental and social implications (Guérin et al., 2025). Conceptual perspectives on human agency in the age of AI further stress that educational and caregiving work involves moral judgement and relational understanding that cannot be delegated to technological systems (Cortés, 2026). Discussions linking AI and child development similarly emphasise the need to avoid simplified narratives of technological benefit and to recognise the developmental sensitivity of educational environments (Neugnot-Ceroli & Laurenty, 2024).

2.6. Synthesis and Research gap

Across the reviewed literature, several conclusions emerge clearly. AI is widely discussed as a tool for supporting inclusion, differentiation, and educational equity, yet empirical evidence remains uneven and strongly concentrated in formal educational environments (Damyanov, 2024; Li et al., 2025; Hussein et al., 2025). Generative AI expands the range of potential support for educators toward text-based synthesis, planning, and tutoring assistance, while also introducing risks that require explicit professional oversight (Al Afnan et al., 2023; Memarian & Doleck, 2023; Milakis et al., 2024). Ethical frameworks provide important principles but require translation into practical safeguards tailored to childcare settings (Jobin et al., 2019; Guérin et al., 2025; Holmes et al., 2023).

What remains insufficiently explored is a practice-based account of how AI can support inclusive educational planning in residential childcare, where professionals must reconcile institutional rules, cultural contexts, health-related constraints, and the need to maintain meaningful participation for children exposed to social disadvantage. This gap motivates the present study's case-based approach, which treats AI not as a decision-making authority but as a tool that may support educators in organising complex information and preparing feasible educational activities within demanding institutional environments

3. Research Problem

Despite the rapid expansion of research on AI in education, relatively little attention has been devoted to the specific conditions of residential childcare. Educational work in these environments differs significantly from conventional school settings because it is closely intertwined with caregiving responsibilities, institutional routines, and the diverse life situations of children who are often exposed to risks of social exclusion. Professionals working in residential childcare must continuously integrate heterogeneous sources of information, including institutional regulations, cultural and linguistic contexts, health-related considerations, and individual developmental needs. This complexity makes educational planning both cognitively demanding and highly contextual. Recent advances in accessible AI technologies raise the question of whether such tools may assist professionals in managing this complexity. Systems capable of processing and synthesising textual information may support educators in tasks such as language mediation, interpretation of cultural frameworks, preparation of educational activities, or consultation of health and dietary recommendations relevant to everyday care. In this sense, AI can function as a supportive analytical instrument that helps professionals organise information and structure educational planning more effectively.

The central research problem of this study therefore concerns the extent to which currently available AI tools can function as inclusive support instruments in residential childcare. More specifically, the study examines whether AI-assisted tools can contribute to more effective professional practice in residential care settings, facilitate better alignment between educational activities and children's individual needs, and ultimately strengthen the conditions that support the social inclusion and developmental opportunities of children growing up in residential childcare. Based on this problem, the study addresses the following research question:

To what extent can accessible AI tools support inclusive educational planning in residential childcare by assisting educators in interpreting contextual information and preparing educational activities?

4. Methods

This section outlines the methodological approach adopted in the study and explains how the empirical material was generated and analysed. The research is grounded in a qualitative, practice-oriented perspective that examines artificial intelligence as a supportive instrument in the everyday professional work of educators in residential childcare. Particular attention is devoted to the interaction between human professional judgement and AI-assisted tools when preparing educational activities in complex institutional contexts. The section therefore describes the research design, the case study framework, the analytical procedure, and the ethical safeguards applied during the study.

4.1. Research Design

This study adopts a qualitative, practice-oriented research design aimed at exploring the potential of artificial intelligence as a supportive tool in educational and caregiving practice within residential childcare. The research does not examine AI as an autonomous decision-making system. Instead, AI is approached as an assistive instrument that may support professionals in organising complex information and preparing educational and developmental activities for children living in residential care. The study focuses on the interaction between human professional judgement and AI-generated suggestions in real planning situations. The central analytical interest therefore lies in identifying domains in which AI tools may contribute to structuring information, clarifying contextual tensions, and supporting the preparation of inclusive educational activities within demanding institutional environments.

4.2. Data Generation and Dataset

The empirical material consists of a set of structured interactions between educators and an AI-based conversational system, generated in the course of authentic educational planning situations in residential childcare. These interactions emerged within the context of everyday professional practice in residential childcare, reflecting routine educational planning activities. The data take the form of documented records of routine planning activities captured during the second half of 2025, within the context of daily institutional operation. Educators formulated prompts in response to specific planning challenges, including situations involving cultural diversity, identity-sensitive contexts, health-related limitations, and routine educational support.

Across the analysed cases, multiple prompt–response sequences were produced in order to explore how the AI system responded to different types of professional questions. The dataset therefore reflects a range of interaction patterns rather than a single linear exchange. For analytical purposes, selected interaction segments were documented and subsequently organised into case-based representations. These cases do not constitute complete transcripts but analytically constructed examples that capture recurrent forms of AI-assisted support observed in practice.

Access to the underlying materials is governed by the ethical considerations outlined below, reflecting the sensitive nature of the research context and the need to ensure the protection of children and institutional environments.

4.3. Case Study Framework

The methodological framework of this study is based on a multiple case study design. Case study methodology is particularly suitable for examining complex social situations embedded in real-life contexts, where professional decision-making unfolds under multiple institutional and relational constraints (Patnaik & Pandey, 2019; Shrestha & Bhattarai, 2021). In residential childcare, educational planning is closely intertwined with caregiving responsibilities, institutional routines, and the diverse life circumstances of children. For this reason, a case-based analytical approach provides an appropriate framework for capturing the complexity of everyday professional practice.

The analysed cases represent different situations that professionals may encounter in residential childcare. These include contexts involving cultural and linguistic diversity, gender identity sensitivity, health-related limitations requiring dietary adaptations, and a situation involving a child without significant developmental difficulties. In each case, AI tools were used by educators to assist with specific planning tasks such as language mediation, interpretation of cultural frameworks, preparation of educational activities, or consultation of information relevant to everyday care.

The interactions with the AI system were conducted using the freely accessible version of ChatGPT. Structured prompts were formulated to reflect real professional questions arising during educational planning. The generated responses were subsequently examined in relation to their relevance, practical usefulness, and potential implications for professional decision-making. Across the analysed cases, several structured interactions with the AI system were conducted in order to explore how the tool responded to different professional questions arising during educational planning.

4.4. AI System Specification and User Preparation

All interactions analysed in this study were conducted using the freely accessible version of ChatGPT. The decision to use a publicly available tool was intentional, as it ensured that all participating educators operated under comparable conditions without reliance on specialised or institutionally restricted systems. This approach also reflects the realities of everyday professional practice in residential childcare, where access to advanced technological infrastructure is often limited. At the same time, the use of a widely accessible system increases the ecological validity of the findings, as it corresponds to tools that are realistically available to practitioners in similar institutional contexts. Prior to data generation, educators received brief preparatory guidance focused on the formulation of prompts and the critical interpretation of AI-generated outputs. This was particularly important for participants with limited prior experience with digital tools. The preparation did not aim to standardise responses, but to ensure a basic level of functional literacy in interacting with the system. This step contributed to the consistency of interactions while preserving the authenticity of practice-based problem situations. In this sense, the study balances minimal methodological structuring with the preservation of naturally occurring professional inquiry.

4.5. Analytical Approach

The analytical focus of the study lies not in evaluating the technical performance of the AI system, but in examining how AI-assisted tools may support human professionals in addressing complex situations in residential childcare. The analysis concentrates on the role of AI in mediating the interpretation of contextual information, structuring planning processes, and supporting reflective decision-making under conditions of uncertainty. Data analysis followed an interpretative qualitative approach, beginning with a close reading of documented interaction records in relation to the professional contexts in which they were produced. Initial coding was conducted inductively, focusing on the types of support provided by the AI system, including the interpretation of

contextual factors, the anticipation of potential tensions, the generation of activity proposals, and the facilitation of professional reflection.

Through iterative comparison across cases, these codes were progressively refined and organised into broader analytical domains. The analysis did not treat individual interactions as isolated instances, but instead examined recurring functional roles of AI within the planning process. Each case was interpreted with attention to the interaction between AI-generated outputs and the educator's professional judgement, including how suggestions were adopted, modified, or critically assessed. The final stage involved cross-case synthesis, allowing patterns of AI-assisted support to be articulated at a more abstract level. This process led to the identification of key domains through which AI contributes to educational planning in residential childcare, particularly in relation to organising complex information, anticipating contextual sensitivities, and supporting reflective professional thinking.

5. Context, Ethics, and Limitations

This section outlines the institutional and ethical framework within which the study was conducted. Research focusing on professional practice in residential childcare requires careful consideration of contextual conditions, ethical safeguards, and methodological constraints. The section therefore describes the research environment in which the case studies emerged, the ethical principles guiding the use of artificial intelligence in sensitive social contexts, and the limitations that should be considered when interpreting the findings.

5.1. Research Context

The study was conducted in the environment of residential childcare, where educational and developmental activities form an integral part of everyday care. Residential childcare institutions provide living arrangements for children whose family situations prevent them from remaining in their original homes. In such settings, educators combine caregiving responsibilities with educational support, often working with children whose life experiences include disrupted schooling, health challenges, cultural or linguistic diversity, and exposure to social disadvantage (Daněk, 2025). Educational planning therefore extends beyond conventional instructional preparation and frequently involves coordinating institutional rules, individual developmental needs, and the practical realities of daily life in residential childcare.

The analysed cases reflect situations commonly encountered in residential childcare practice. These include contexts involving cultural diversity, identity-sensitive situations, health-related constraints requiring specific dietary or activity considerations, and everyday educational support for children without pronounced developmental difficulties. In these cases, the use of AI emerged as part of practical problem-solving undertaken by educators when preparing activities or addressing specific educational needs within the institutional environment.

5.2. Ethical Considerations and Transparency

Research conducted in residential childcare environments requires careful ethical reflection, particularly when research involves children and other vulnerable populations. Ethical frameworks in social research emphasise the importance of protecting participants' dignity, privacy, and well-being throughout the research process (Alderson & Morrow, 2011; Israel & Hay, 2006). In the present study, all case descriptions were anonymised in order to protect the identities of the children and institutions involved. The analysis focuses on professional planning processes and does not involve personal data or identifiable information related to specific individuals.

The study also reflects broader ethical discussions concerning the responsible use of artificial intelligence in social and educational contexts. AI-assisted tools were not used to make decisions about children or to generate diagnostic conclusions. Instead, they functioned exclusively as analytical and planning support for educators. All professional decisions regarding educational activities, care routines, and interpretation of children's needs remained the responsibility of the human professionals involved. These principles align with current discussions on the governance of

AI, which emphasise transparency, human oversight, and the avoidance of automated decision-making in situations involving vulnerable individuals (Jobin et al., 2019; Yan et al., 2024).

Methodological transparency was supported through the documentation of analytical notes, anonymised case descriptions, and selected interaction records generated during the research process. These materials form an audit trail that underpins the interpretation of the findings. Access to these materials is necessarily restricted due to the sensitivity of the research context; however, anonymised components of the dataset may be made available by the author upon reasonable request, subject to safeguards ensuring the protection of children and institutional environments.

5.3. Methodological Limitations

Several limitations should be acknowledged when interpreting the findings of this study. First, the research is based on a qualitative case study design and therefore does not aim to produce statistically generalisable conclusions. The objective is instead to explore situated professional practices in which AI-assisted tools may support educational planning in residential childcare.

Second, the study focuses on the use of widely accessible AI tools instead of specialised institutional systems. The analysis therefore reflects exploratory professional practice conducted under everyday conditions, not a controlled technological implementation within a formal research infrastructure. In this context, it is also necessary to acknowledge the potential occurrence of AI-generated inaccuracies. The system occasionally produced responses that reflected generalised international models of residential care, including references to social service frameworks that do not correspond to the Czech educational context. Such discrepancies indicate that AI outputs may reproduce dominant discourses that are only partially applicable to specific institutional environments.

A related limitation concerns the domain-specific boundaries of professional expertise. In situations involving health-related recommendations, AI-generated outputs require heightened caution, as educators in residential childcare are not trained healthcare professionals. While the system was able to generate plausible suggestions, these could not be treated as clinically valid guidance and required critical verification. This illustrates that the reliability and applicability of AI outputs depend not only on their internal coherence but also on their alignment with the professional competencies of the user.

Third, the study reflects practice-based observations from a specific institutional environment, which limits the transferability of findings to other residential childcare systems. Finally, the interpretation of AI-assisted outputs inevitably depends on the professional judgement of educators who use the tools in practice. AI may assist in organising information or suggesting possible approaches, but it cannot replace contextual understanding, ethical responsibility, or pedagogical experience. The findings should therefore be understood as an exploratory contribution to understanding how accessible AI technologies may support inclusive educational planning in residential childcare.

6. Results

The results are presented through a series of brief case studies reflecting practical situations encountered in residential childcare. Each case illustrates how educators used an AI-based conversational tool to support educational planning or everyday pedagogical decision-making. The aim of the analysis was not to evaluate the technical performance of the system but to examine how accessible AI tools may assist professionals in organising complex information and identifying possible approaches to educational or developmental activities.

In all analysed cases, the freely accessible version of ChatGPT was used as a supportive analytical tool. The system was employed to process contextual information provided by the educator and to generate suggestions that could subsequently be evaluated and adapted within the professional framework of residential childcare practice.

6.1. Case 1: Cultural and Religious Background in Residential Childcare

An educator working in residential childcare encountered a situation involving a boy from an Arab cultural background whose everyday practices were strongly influenced by religious traditions. Some elements of the institutional routine and planned educational activities appeared to be in potential tension with aspects of the child's cultural and religious context.

The educator sought to identify possible points of sensitivity in order to avoid misunderstandings and to design activities that would respect the child's background while remaining compatible with institutional rules. The analytical structure of the case is presented in Table 1.

Table 1. AI-assisted analysis of cultural and religious context

Analytical dimension	Description
Case context	Boy from an Arab cultural background living in residential childcare. Religious traditions influenced everyday practices.
Main problems addressed	Possible tensions between institutional routines and religious practices; limited familiarity of staff with the cultural background; risk of unintentional exclusion from group activities.
Prompt used	"Compare the following institutional rules with key cultural and religious principles relevant for Muslim children and identify areas where misunderstandings or tensions might arise. Suggest ways educators can organise activities that respect both institutional rules and the child's cultural background."
Information provided to AI	Anonymised description of institutional routines and contextual information about the child's cultural background.
Types of outputs generated by AI	Identification of potential intersections between institutional routines and religious practices (e.g., dietary considerations, daily schedules); suggestions for culturally sensitive communication; recommendations for adapting certain activities; proposals for educational activities incorporating cultural elements. Illustrative excerpt from AI output: "Educators may consider aligning daily routines with key religious practices, including dietary restrictions and flexible scheduling where feasible. Activities can incorporate cultural elements to support inclusion while maintaining group cohesion."
Professional interpretation	AI outputs were critically evaluated by the educator before any practical adjustments were considered. AI served as a reflective support tool while all decisions remained the responsibility of the educator.

In practice, the adjustments informed by this analysis contributed to a more sensitive organisation of activities, which appeared to support the child's participation without observable tension in group interaction. At the same time, the process supported educators in developing a more nuanced understanding of the child's cultural and religious background. This is particularly relevant in the Czech context, where familiarity with Islamic traditions may be limited, and educators may therefore encounter uncertainty when addressing culturally specific needs in everyday practice.

6.2. Case 2: Gender Identity Sensitivity in Residential Childcare

Another case concerned a child whose gender identity raised questions among staff regarding communication and the organisation of certain group activities within the residential environment.

Educators sought ways to ensure that the child could participate fully in educational and leisure activities while maintaining a respectful and supportive atmosphere for all children living in the institution. AI was utilised as an instrument for structuring analysis to explore possible communication approaches and inclusive activity structures that could help educators navigate this situation in a balanced and respectful manner. The analytical structure of the case is presented in Table 2.

Table 2. AI-supported strategies for gender-sensitive educational practice

Analytical dimension	Description
Case context	Child in residential childcare whose gender identity raised questions among staff regarding communication and organisation of certain group activities.
Main problems addressed	Uncertainty regarding appropriate language and communication; need to maintain a respectful and safe environment for all children; preparation of inclusive educational activities; limited previous experience of staff with similar situations.
Prompt used	“Suggest approaches educators can use to organise inclusive educational activities for a child experiencing gender identity sensitivity in a residential childcare environment. Focus on communication strategies and activity planning that support participation and respect.”
Information provided to AI	Anonymised contextual description of the residential setting and the educational situation requiring preparation of group activities.
Types of outputs generated by AI	Recommendations for respectful communication strategies; proposals for group activities built around cooperation rather than identity categorisation; general principles for creating inclusive educational environments; and ideas supporting participation while maintaining a supportive group climate. Illustrative excerpts from AI output: “Educators may use language that affirms the child’s identity while maintaining a respectful and balanced group environment.” “Activities structured around shared goals and collaboration can support inclusion without emphasising individual differences.”
Professional interpretation	AI outputs were treated as reflective input supporting the educator’s planning process. All practical decisions were subsequently evaluated in relation to professional judgement, institutional policies, and the wellbeing of the children involved.

The approaches informed by this analysis contributed to more stable and confident communication in situations involving gender identity sensitivity. Educators reported a reduction in uncertainty when addressing identity-related questions and in organising group activities in a respectful manner. This development became particularly evident in subsequent situations, where, upon the arrival of another child with similar identity-related needs, educators approached communication with greater confidence and sensitivity, drawing on strategies they had previously developed. These observations suggest that AI-supported reflection may contribute to the gradual development of professional competences in areas where prior experience is limited.

6.3. Case 3: Health-Related Limitations and Dietary Considerations

This case involved an educator working with a child experiencing health-related limitations associated with metabolic complications requiring specific dietary considerations. In this situation, everyday planning of activities required balancing educational objectives with the child’s physical well-being. AI functioned as a supportive instrument to explore possible ways of organising daily routines, physical activities, and educational tasks that would respect the child’s health needs while enabling active participation in the life of the residential group. The analytical structure of the case is presented in Table 3.

The adjustments informed by this analysis were reflected in practical modifications of everyday planning. Certain physically demanding or potentially risky activities were reconsidered or excluded in order to align with the child’s health condition. At the same time, educators adapted routine practices associated with group activities, including the preparation of appropriate meals during excursions.

For example, travel lunch boxes were more carefully planned to reflect dietary requirements, thereby reducing the risk of health-related complications and supporting the child’s full participation in group activities. These observations indicate that AI-assisted planning may support the integration of health-related considerations into everyday educational practice, while remaining dependent on professional judgement and external expertise.

Table 3. AI-assisted planning for health-related limitations

Analytical dimension	Description
Case context	Child in residential childcare experiencing metabolic health complications requiring dietary awareness and careful planning of physical activities.
Main problems addressed	Need for dietary awareness in everyday institutional routines; planning physical activities appropriate to the child's health condition; integrating educational and health considerations into daily schedules; supporting participation without unnecessary restrictions.
Prompt used	"Suggest educational and leisure activities suitable for a child with metabolic health limitations in residential childcare. Include considerations related to diet, physical activity, and participation in group activities."
Information provided to AI	Anonymised contextual description of the child's health limitations and the institutional setting in which daily educational and leisure activities were organised.
Types of outputs generated by AI	Suggestions for moderate physical activities appropriate for children with health limitations; recommendations for structuring daily routines in line with dietary requirements; proposals for educational activities integrating health awareness; and ideas for inclusive group activities that support participation without placing the child at a disadvantage. Illustrative excerpts from AI output: "Physical activities may be adjusted to lower intensity levels while maintaining opportunities for participation and social interaction." "Daily routines can be organised to respect dietary needs, including the preparation of appropriate meals during excursions or group activities."
Professional interpretation	The outputs informed the educator's planning process as tentative suggestions rather than directives. Final decisions were made with regard to professional judgement, health considerations, and institutional routines.

6.4. Case 4: Educational Support for a Child Without Significant Difficulties

Another case concerned a child without major developmental or educational difficulties who occasionally required academic support and opportunities for meaningful engagement in leisure and educational activities within the residential setting.

Although the child did not face pronounced barriers, educators still needed to provide structured support that would maintain motivation for learning and encourage participation in group activities. In this situation, AI supported the generation of ideas for educational activities and informal tutoring strategies appropriate to residential childcare settings. The analytical structure of the case is presented in Table 4.

The application of these suggestions was reflected in adjustments to the organisation of everyday educational support. In particular, periods of tutoring and homework preparation were interspersed with structured leisure activities, allowing for a more balanced distribution of cognitive demands.

This arrangement appeared to reduce signs of fatigue and contributed to sustained engagement in learning tasks. At the same time, the integration of educational and leisure elements supported the child's motivation and participation within the residential group. These observations suggest that AI-assisted planning may help educators refine the temporal and pedagogical structure of informal learning situations in residential childcare, while maintaining sensitivity to individual rhythms and needs.

Table 4. AI-supported educational activities in residential childcare

Analytical dimension	Description
Case context	School-age child living in residential childcare without significant developmental or educational difficulties but requiring occasional academic support and engagement in meaningful activities.
Main problems addressed	Maintaining motivation for learning; preparation of structured activities outside school hours; providing occasional tutoring support; encouraging participation in group educational activities.
Prompt used	“Suggest educational and leisure activities that can support learning motivation for a school-age child living in residential childcare. Include ideas for tutoring support and group activities.”
Information provided to AI	Anonymised contextual description of the residential setting and the child’s need for occasional tutoring support and structured leisure activities.
Types of outputs generated by AI	Ideas for structured learning activities outside school hours; recommendations for tutoring strategies adapted to informal educational settings; suggestions for educational games and group-based learning activities; and proposals for combining leisure activities with learning opportunities. Illustrative excerpt from AI output: “Learning activities can be interspersed with leisure elements to maintain engagement and reduce fatigue, while still supporting the completion of school-related tasks.”
Professional interpretation	The outputs served as a source of inspiration in the preparation of educational activities within the residential setting. All proposed activities were subsequently adapted by the educator to reflect the specific institutional context and the individual needs of the child.

6.5. Case 5: Reflective Support for a Residential Childcare Educator

The final case does not focus on a specific child but on the professional role of an educator working in residential childcare. The educator reflected on the complexity of everyday responsibilities that combine caregiving, educational planning, communication with schools, and support for children experiencing various social and developmental challenges. In this situation, an AI-based conversational tool served as a reflective instrument for exploring how professional practice might be structured more effectively and how a high standard of work could be sustained within a demanding institutional environment. The analytical structure of the case is presented in Table 5.

Table 5. AI-assisted professional reflection of educators

Analytical dimension	Description
Case context	Reflection on the professional role of an educator in residential childcare responsible for caregiving, educational planning, communication with schools, and support for children facing diverse developmental and social challenges.
Main problems addressed	High complexity of professional responsibilities; need to balance caregiving, educational support, and administrative tasks; emotional and cognitive demands associated with working with vulnerable children; uncertainty regarding sustainable organisation of everyday professional practice.
Prompt used	“What should I do in order to do my job well as an educator in residential childcare?”
Information provided to AI	Anonymised contextual description of the educator’s professional responsibilities and everyday working conditions in residential childcare.
Types of outputs generated by AI	Emphasis on building stable and trusting relationships with children; recommendations for maintaining consistent daily routines and clear expectations; suggestions for supporting educational development through everyday activities; guidance on communication with colleagues, schools, and other professionals; and reminders of the importance of professional reflection and self-care. Illustrative excerpts from AI output: “Building trust through consistent daily interaction is a key element of effective work with children in residential care.” “Educators may benefit from regular reflection on their practice, including how they balance caregiving, educational support, and communication with other professionals.”
Professional interpretation	The responses were evaluated as a form of structured reflection rather than prescriptive advice. The AI tool functioned as a reflective support helping the educator organise key aspects of professional practice.

The use of AI in this case revealed the extent to which educators benefit from opportunities for structured reflection and external feedback. The generated responses did not introduce fundamentally new knowledge; instead, they articulated and organised core principles of professional practice in a manner that supported reflective thinking. For the educator, this function proved particularly valuable in situations characterised by cumulative demands and limited time for systematic reflection within everyday routines. This observation is especially relevant in the Czech context, where formal supervision for educators working in residential childcare is not consistently established as a standard component of professional support. As a result, opportunities for guided reflection may be irregular or dependent on institutional conditions. In this setting, AI-assisted tools may offer a provisional form of reflective scaffolding, helping educators to structure their thinking, revisit key professional principles, and maintain clarity in demanding situations. At the same time, such tools cannot substitute for professional supervision or collegial support, which remain essential for addressing the emotional and relational dimensions of work in residential childcare.

6.6. Cross-Case Synthesis of AI-Assisted Support

AI contributed as an analytical resource through which educators could organise their thinking and explore potential approaches to educational planning. The results suggest that even freely accessible AI tools may assist professionals in identifying contextual factors and generating ideas for inclusive educational activities within residential childcare. Across the analysed cases, several recurring domains of AI-assisted support emerged. These domains are summarised in Table 6.

Table 6. Domains of AI-assisted support in residential childcare

Domain of AI-assisted support	Description
Interpretation of contextual information	AI assisted educators in analysing cultural, social, and institutional contexts relevant for planning educational and leisure activities.
Preparation of educational activities	AI generated ideas for structured educational and leisure activities adapted to the needs and circumstances of children living in residential childcare.
Identification of potential institutional tensions	AI helped identify possible tensions between institutional routines and individual circumstances such as cultural traditions, health considerations, or group dynamics.
Professional reflection	AI served as a reflective conversational tool that supported educators in organising professional thinking and reflecting on their everyday responsibilities.

These domains illustrate that AI can operate as a supportive analytical instrument within residential childcare practice while the responsibility for decisions remains entirely with human professionals.

7. Discussion and Implications for Practice

The cases examined in this study indicate that the relevance of artificial intelligence in residential childcare emerges within the everyday conditions of practice rather than from its technical capabilities alone. Educational work in these settings requires continuous negotiation between institutional expectations and the diverse cultural, developmental, and health-related circumstances of children. Planning is therefore shaped by the need to assemble and interpret fragmented information, often under time constraints and without opportunities for sustained reflection. In this context, AI proved useful as a means of structuring partial understanding. It helped to organise available information and to sketch out possible directions for activities that could subsequently be reconsidered and adapted by the educator.

Across the cases, the role of AI remained limited but discernible. It did not function as a source of authority, nor did it produce decisions. Instead, it introduced alternative ways of framing situations and occasionally drew attention to aspects that might otherwise have remained unarticulated. This was most apparent in situations where educators encountered unfamiliar contexts, including cultural or identity-related questions. In such moments, the interaction supported

a shift from uncertainty towards a more considered approach to communication and planning. A comparable dynamic was observed in the case focused on the educator's own role, where the system helped to reorder established principles into a form that could be more readily engaged within the constraints of everyday work.

At the same time, the findings point to clear boundaries. The outputs generated by AI are contingent and often reflect generalised assumptions that do not fully correspond to specific institutional contexts. Their relevance depends on careful interpretation in light of professional experience and local conditions. They cannot replace the situated understanding that develops through ongoing relationships with children. The use of AI in residential childcare therefore remains dependent on professional judgement and ethical responsibility. Under these conditions, it may offer a modest extension of the analytical resources available to educators, without altering the fundamentally relational character of their work.

8. Conclusion

The present study explored whether accessible artificial intelligence tools can support inclusive educational planning in residential childcare. Through a series of practice-oriented case studies, the analysis examined situations in which educators used AI-assisted tools when interpreting complex contextual information and preparing educational or developmental activities for children living in institutional care. The findings suggest that AI can provide meaningful analytical support in environments where professionals must integrate diverse sources of information related to cultural background, health considerations, institutional routines, and everyday educational needs. In the analysed cases, AI primarily assisted educators in organising contextual knowledge, identifying potential sensitivities, and generating ideas for activities that could subsequently be evaluated and adapted through professional judgement.

If artificial intelligence can assist professionals in organising complex contextual information, what role might such tools play in strengthening inclusive educational practice in residential childcare in the years ahead? The results of this study indicate that the value of AI in this environment lies not in replacing professional decision-making but in extending the analytical resources available to educators. When used within clear ethical boundaries and under human oversight, accessible AI tools may support reflection, planning, and the preparation of educational activities that respond to the diverse life situations of children living in care. Artificial intelligence will not replace the human relationships at the centre of residential childcare, but it may quietly strengthen the professional capacity to understand, interpret, and respond to the complex realities in which these relationships unfold.

References

- Al Afnan, M. A., Dishari, S., Jovic, M., & Lomidze, K. (2023). ChatGPT as an educational tool: Opportunities, challenges, and recommendations for communication, business writing, and composition courses. *Journal of Artificial Intelligence and Technology*, 3(2), 60–68. <https://doi.org/10.37965/jait.2023.0184>
- Alderson, P., & Morrow, V. (2011). *The ethics of research with children and young people: A practical handbook*. SAGE. <https://doi.org/10.4135/9781446268377>
- Ambagtsheer, R. C., Shafiabady, N., Dent, E., Seiboth, C., & Beilby, J. (2020). The application of artificial intelligence (AI) techniques to identify frailty within a residential aged care administrative data set. *International Journal of Medical Informatics*, 136, Article 104094. <https://doi.org/10.1016/j.ijmedinf.2020.104094>
- Bekeš, E. R., & Galzina, V. (2023). Exploring the pedagogical use of AI-powered chatbots: Educational perceptions and practices. In *Proceedings of the 46th MIPRO ICT and Electronics Convention (MIPRO 2023)* (pp. 636–641). <https://doi.org/10.23919/mipro57284.2023.10159734>

- Brooker, L. (2006). From home to the home corner: Observing children's identity-maintenance in early childhood settings. *Children & Society*, 20(2), 116–127. <https://doi.org/10.1111/j.1099-0860.2006.00019.x>
- Chen, L., Chen, P., & Lin, Z. (2020). Artificial intelligence in education: A review. *IEEE Access*, 8, 75264–75278. <https://doi.org/10.1109/access.2020.2988510>
- Cortés, E. C. B. (2026). Reinventing the human in the age of AI. In L. F. Rivera-Galicia, J. M. Montero, C. García-Pérez, & E. Senra-Díaz (Eds.), *Teaching innovations in economics*. Springer. https://doi.org/10.1007/978-3-032-08213-8_2
- Damyantov, K. (2024). Differentiation of educational content through artificial intelligence systems in inclusive education. *International Journal of Education (IJE)*, 12(3), 13–24. <https://doi.org/10.5121/ije2024.12302>
- Daněk, A. (2025). Fostering inclusion and skill development in childcare institutions: Lessons from the Visegrad region. *Problems of Education in the 21st Century*, 83(5), 645–662. <https://doi.org/10.33225/pec/25.83.645>
- Daněk, A., Klugerová, J., & Vlach, F. (2025). Empowering vulnerable children through AI: A participatory study from Central Europe. *BRAIN. Broad Research in Artificial Intelligence and Neuroscience*, 16(4), 1–15. <https://doi.org/10.70594/brain/16.4/1>
- Fitas, R. (2025). Inclusive education with AI: Supporting special needs and tackling language barriers. *AI Ethics*, 5, 5729–5757. <https://doi.org/10.1007/s43681-025-00824-3>
- Guérin, R. N., Hofmeijer, E. I. S., Kester, L. M., & Sensmeier, L. W. (2025). The responsible implementation of artificial intelligence in childcare. In J. Bayer & C. Grimme (Eds.), *Code and conscience* (Vol. 14400, pp. 113–133). Springer. https://doi.org/10.1007/978-3-031-52082-2_8
- Holmes, W., Bialik, M., & Fadel, C. (2023). Artificial intelligence in education. In C. Stükelberger & P. Duggal (Eds.), *Data ethics: Building trust: How digital technologies can serve humanity* (pp. 621–653). Globethics Publications. <https://doi.org/10.58863/20.500.12424/4276068>
- Hussein, E., Hussein, M. A., & Al-Hendawi, M. (2025). Investigation into the applications of artificial intelligence (AI) in special education: A literature review. *Social Sciences*, 14(5), Article 288. <https://doi.org/10.3390/socsci14050288>
- Israel, M., & Hay, I. (2006). *Research ethics for social scientists*. SAGE. <https://doi.org/10.4135/9781849209779>
- Jobin, A., Ienca, M., & Vayena, E. (2019). The global landscape of AI ethics guidelines. *Nature Machine Intelligence*, 1(9), 389–399. <https://doi.org/10.1038/s42256-019-0088-2>
- Li, J., Yan, Y., & Zeng, X. (2025). Exploring artificial intelligence in inclusive education: A systematic review of empirical studies. *Applied Sciences*, 15(23), Article 12624. <https://doi.org/10.3390/app152312624>
- Lucas, S. E., Burns, A., Emond, R., & Reid, L. (2024). Digital group archives in residential childcare: An investigation into memory responsibility. *Families, Relationships and Societies*, 14(3), 402–418. <https://doi.org/10.1332/20467435Y2024D0000000034>
- Memarian, B., & Doleck, T. (2023). ChatGPT in education: Methods, potentials, and limitations. *Computers in Human Behavior: Artificial Humans*, 1(2), Article 100022. <https://doi.org/10.1016/j.chbah.2023.100022>
- Milakis, E. D., Argyrakou, C. C., Loukisas, T., Vangeli, D. G., Katsarou, M. C., & Lalou, A. (2024). Comparative analysis of large language models as AI assistants for educational assessment: A case study in STEAM education. *International Journal of Computing and Artificial Intelligence*, 5(2), 51–60. <https://doi.org/10.33545/27076571.2024.v5.i2a.97>
- Mpu, Y. (2024). Bridging the knowledge gap on special needs learner support: The use of artificial intelligence (AI) to combat digital divide post-COVID-19 pandemic and beyond: A comprehensive literature review. In F. Altinay & Z. Altinay (Eds.), *Education and human development* (Vol. 13). IntechOpen. <https://doi.org/10.5772/intechopen.113054>

- Neugnot-Cerlioli, M., & Laurenty, O. M. (2024). *The future of child development in the AI era: Cross-disciplinary perspectives between AI and child development experts* (Version 1). arXiv. <https://doi.org/10.48550/arXiv.2405.19275>
- Panigrahy, S. (2025). AI technologies transforming nonprofit care services: Applications in orphan support and senior living. *Journal of Information Systems Engineering & Management*, 10, Article 306. <https://doi.org/10.52783/jisem.v10i59s.12847>
- Patnaik, S., & Pandey, S. C. (2019). Case study research. In R. N. Subudhi & S. Mishra (Eds.), *Methodological issues in management research: Advances, challenges, and the way ahead* (pp. 163–179). Emerald. <https://doi.org/10.1108/978-1-78973-973-220191011>
- Bargavi, R., & Jucunda, M. E. (2025). ChatGPT in education: Boon or bane? *Journal of Information Technology Teaching Cases*. <https://doi.org/10.1177/20438869251326278>
- Rejeb, A., Rejeb, K., Appolloni, A., Treiblmaier, H., & Iranmanesh, M. (2024). Exploring the impact of ChatGPT on education: A web mining and machine learning approach. *The International Journal of Management Education*, 22(1), Article 100932. <https://doi.org/10.1016/j.ijme.2024.100932>
- Roshanaei, M., Olivares, H., & Lopez, R. R. (2023). Harnessing AI to foster equity in education: Opportunities, challenges, and emerging strategies. *Journal of Intelligent Learning Systems and Applications*, 15(4), 123–143. <https://doi.org/10.4236/jilsa.2023.154009>
- Seo, K., Tang, J., Roll, I., Fels, S., & Yoon, D. (2021). The impact of artificial intelligence on learner–instructor interaction in online learning. *International Journal of Educational Technology in Higher Education*, 18(1), Article 54. <https://doi.org/10.1186/s41239-021-00292-9>
- Shrestha, P., & Bhattarai, P. (2021). Application of case study methodology in the exploration of inclusion in education. *American Journal of Qualitative Research*, 6(1), 73–84. <https://doi.org/10.29333/ajqr/11461>
- Urmeneta, A., & Roméro, M. (Eds.). (2024). *Creative applications of artificial intelligence in education*. Palgrave Macmillan. <https://doi.org/10.1007/978-3-031-55272-4>
- Wang, S., Wang, F., Zhu, Z., Wang, J., Tran, T., & Du, Z. (2024). Artificial intelligence in education: A systematic literature review. *Expert Systems with Applications*, 252, Article 124167. <https://doi.org/10.1016/j.eswa.2024.124167>
- Yan, L., Sha, L., Zhao, L., Li, Y., Martinez-Maldonado, R., Chen, G., Li, X., Jin, Y., & Gašević, D. (2024). Practical and ethical challenges of large language models in education: A systematic scoping review. *British Journal of Educational Technology*, 55(1), 90–112. <https://doi.org/10.1111/bjet.13370>
- Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education – Where are the educators? *International Journal of Educational Technology in Higher Education*, 16(1), Article 39. <https://doi.org/10.1186/s41239-019-0171-0>