AI-Empowered Self-Directed Play: Practical Pathways of "Human–AI Collaborative Thinking" and Strategies for Supporting Children's Development

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Abstract: Self-directed play is the core domain in which young children explore freely and construct knowledge actively. As artificial intelligence (AI) is applied extensively in early childhood education, however, the educational value of self-directed play risks being eroded by the "standard-answer logic" of AI. This study addresses the central question of AI application in self-directed play: how to preserve the distinctive value of self-directed play for children's development when AI assistance is introduced. Grounded in Loris Malaguzzi's educational philosophy of "The Hundred Languages of Children" and in the paired-assistance work through which Foshan Chancheng Government Offices No.1 Kindergarten, supports kindergartens in the Qiandongnan Miao and Dong Autonomous Prefecture, Guizhou Province, and in Luoding, this study reconceptualises "human–AI collaborative thinking" and clarifies a triangular interaction logic of "teacher-led, child-centred, AI-assisted". Through in-depth analysis of self-directed play scenarios such as the constructive play "Hamster City" and generative story creation, three core principles are identified for resolving the dilemmas of "AI labelling" and "AI unified narrative": two-way integration (combining teachers' observations with AI analyses), pause-and-compare (suspending judgement and comparing AI analyses with teachers' analyses), and co-thinking within the professional learning community (PLC). On this basis, the interactive mechanism of "teacher–child–AI collaborative creation" is refined and formalised, yielding a replicable model of AI-supported self-directed play for frontline preschool teachers and offering practical reference for preserving a child-centred stance in the intelligent transformation of preschool education.

Keywords: children's self-directed play; AI-supported strategies; human–AI collaborative thinking; preschool teachers; high-quality development

I. Revisiting the Unique Value of Self-Directed Play for Children's Development

Self-directed play is play that young children initiate and direct in accordance with their own interests and intrinsic motivation, deciding independently on its content, materials, playmates and forms. It has three core characteristics: freedom of choice, active engagement and creative expression. The Guidelines for Assessing the Quality of Preschool Education and Care issued by the Ministry of Education regard "respecting children's central position in play" as a key indicator of quality, which attests to the irreplaceable educational value of self-directed play. Malaguzzi's idea of "the hundred languages of children" reveals the diverse ways in which young

children construct their world and is closely aligned with the core spirit of self-directed play: play is the natural field in which children draw on multiple symbol systems—movement, image, construction, drama and imagination—to express, negotiate and create. At present, frontline kindergartens face three typical dilemmas in applying AI: AI labelling, AI unified narrative and AI homogenisation. All three stem from a fundamental conflict between the technical logic of AI, in which the standard answer comes first, and the core spirit of multiple expression that animates self-directed play. Re-examining the unique value of self-directed play in the AI era and exploring support strategies that draw on AI while preserving a child-centred stance is therefore a key task in the intelligent transformation of preschool education.

II. A Practical Scenario: Using AI Behaviour Analysis to Address the "AI Labelling" Dilemma—The Case of "Hamster City" Self-Directed Play

A. The Representativeness of the "Hamster City" Case

During self-directed play, the children spontaneously used building blocks, cardboard boxes and other materials to construct a "city". They laid out intersecting roads and built houses of different heights and bridges. The children then placed a small hamster in the scene and watched its movements closely. Whenever the hamster could not get through, was blocked or could not climb a slope, they immediately adjusted, widened or raised the structure, added a bridge, or rebuilt it. Some children held the blocks steady, some watched the route and others proposed new ideas. The play lasted for nearly 30 minutes, and the children remained highly focused throughout.

The assistant teacher entered detailed observation records into an AI analysis tool, which produced the following conclusions: the children were engaged in exploratory construction play driven by an authentic situation; their zone of proximal development centred on the structural stability of the spatial layout, cooperative negotiation, causal reasoning and dynamic adaptation; and their learning needs included hierarchical construction materials, connectable accessories, contextual scaffolds and open-ended questioning.

Reading the report, however, the teacher was left with a question. The AI had analysed accurately what the children did and which abilities they developed, yet it never addressed what she considered the central issue: why were the children able to stay focused for nearly 30 minutes? Drawing on her deep knowledge of the children, she recognised the real driving force—the children's genuine affection for and curiosity about the hamster. They wanted to build a city in which the hamster would enjoy walking.

Having integrated the AI analysis with her on-site judgement, the teacher drew the following conclusions: the children were in a period of deep construction and inquiry driven by an authentic situation; their motivation came from their care for and curiosity about the small animal; their learning followed a cyclical pattern of observe–try–adjust–recreate; and they needed open-ended, changeable and extendable materials, together with process-oriented guidance anchored in real problems.

On this basis, the teacher developed a support plan. She provided materials of different kinds—blocks of varying length, width and hardness, ramps, connectors and transparent pipes—and designed open-ended questions to support thinking, such as "Why did the hamster stop here?" and

"How can we make the roads smoother?" She also encouraged the children to share the work, with some observing and others recording the hamster's route, so that they could continue to refine their construction through authentic experience.

B. The Labelling Tendency Revealed in AI Analysis

The AI described and evaluated the children along dimensions such as "dynamic adaptation ability" and "structural stability of the layout" rather than through generalised labels such as "moderate collaborative competence". Seemingly precise as these developmental dimensions are, they remain labels in essence: the general label has merely been upgraded into a "scientific" and finely calibrated one. The issue is not whether the AI analysis is accurate but what the teacher does with it. If she stops at the AI's conclusion, what she obtains is a list of developmental abilities rather than an understanding of this particular play and this particular child. She knows what abilities to develop, but may have lost sight of why the children were so engaged.

C. Three Key Actions through Which "Human–AI Collaborative Thinking" Addresses AI Labelling

In the "Hamster City" case, the key actions through which the teacher overcame the labelling dilemma can be summarised at three levels. At the first level, the teacher pauses once the AI analysis is in hand: she does not write the AI's "zone of proximal development" and "learning needs" directly into the record, but stops to ask whether what the AI says matches what she saw, and what has been left out. At the second level, she compares the AI analysis with her on-site judgement, setting her professional intuition ("the children are this focused because they love the hamster") against the AI analysis and finding the two complementary rather than mutually exclusive: the AI supplies a framework for what to develop, while the teacher's judgement reveals the driving mechanism behind why it develops. The relationship is additive—AI analysis plus teacher understanding. At the third level, she integrates and refines the two within the professional learning community (PLC): other teachers' perspectives further enrich the judgement that learning motivation comes from care for and curiosity about small animals, raising it from an individual feeling to a collective consensus. The conclusion finally produced is the crystallisation of the community's collective deliberation.

III. A Three-Step Method of Observation and Analysis for Addressing the AI Labelling Dilemma

The approach demonstrated in the "Hamster City" case was taken up by the professional learning community and distilled into an actionable three-step method of observation and analysis. The first step is to observe calmly and record in detail. At this stage the teacher makes no analysis or judgement, recording only what is seen and what is heard. In the case, the assistant teacher made a complete video recording and kept detailed notes—"laying out intersecting roads", "adjusting immediately when the hamster could not get through", "someone held the blocks steady, someone watched the route". These original records are the foundation of all subsequent analysis. In self-directed play this step is particularly important, because the core value of such play lies in the specific behaviour of this particular child at this particular moment. The second step is to exchange views with peers and form a preliminary understanding. The teacher shares the observation records and her own intuitions and judgements within the PLC, so that individual observation is

verified through dialogue. The third step is human–AI comparison and integrated refinement. Only after the first two steps does the teacher turn to AI for multi-dimensional analysis, setting the AI output against her own understanding and ultimately producing a support plan that combines data-informed reference with educational warmth. The value of AI lies not in supplying authoritative answers but in providing a frame of reference and a further dimension of verification for teachers' professional judgement.

IV. When AI Should Enter Self-Directed Play and How Teachers' Roles Are Positioned

The core principle governing the timing of AI involvement is this: AI may offer "another perspective" and a "quantitative reference" after the teacher has observed, but it must never predetermine what children should be like before the teacher has observed. The teacher's first-hand understanding of children always takes precedence over the second-hand analysis of AI. Teachers play three roles in AI-assisted self-directed play. First, the teacher acts as input provider: the more specific and detailed the observation records she supplies, the more targeted the AI analysis will be. Only when descriptions such as "laying out an intersecting road" or "widening the road as soon as the hamster cannot get through" are supplied can the AI analyse spatial layout, cooperative negotiation and dynamic adaptation. Teachers must therefore first become high-quality observers and recorders. Second, the teacher acts as interlocutor: confronted with the AI's initial analysis, she needs to keep asking, "Did you capture that the children stayed engaged because they loved the hamster?" and "What developmental significance does this observe–try–adjust cycle have?", prompting the AI to move from label output towards contextual understanding. Teachers thus become the spokesperson for children and the narrator of the situation. Third, the teacher acts as decision-maker: AI analysis ultimately bears on educational action. The teacher decides on the basis of a comprehensive understanding of the children—providing blocks of different lengths and widths, using open-ended questions to stimulate thinking, and encouraging the children to divide the observation tasks among themselves. Decision-making authority always rests with the teacher; this is the ethical bottom line of human–AI collaborative thinking.

V. Conclusion

Conducted in the real setting of self-directed play, this study demonstrates the feasibility of human–AI collaborative thinking as a core methodology for early childhood education in the AI era. The cases presented here suggest that AI can serve as an additional pair of eyes for teachers' professional growth, but that it cannot become a standard-answer machine replacing teachers' professional judgement. AI may extend the "data eye" of observation, but it must not displace the child-centred core of education. When AI analysis, teachers' on-site judgement and the collective wisdom of the professional learning community enter into a co-creative relationship of harmony without uniformity, teachers can draw on technology to broaden their professional vision while holding to a child-centred stance and preserving the authenticity of education. The three-step method of observation and analysis and the three-tier role model of the teacher as input provider, interlocutor and decision-maker developed in this study can serve as a replicable model of AI support in self-directed play, offering practical reference for more kindergartens seeking to preserve a child-centred stance in their intelligent transformation.

References

[1] Ministry of Education of the People's Republic of China. Guidelines for Assessing the Quality of Preschool Education and Care [R]. Beijing: Ministry of Education of the People's Republic of China, 2022.

[2] Malaguzzi L. The Hundred Languages of Children [M]. Nanjing: Nanjing Normal University Press, 2006.

[3] Piaget J. The Language and Thought of the Child [M]. Beijing: Culture and Education Press, 1980.

[4] Ministry of Education of the People's Republic of China. Guidelines for the Learning and Development of Children Aged 3–6 [R]. Beijing: Ministry of Education of the People's Republic of China, 2012.

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