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A parental emotion coaching dialogue assistant for better parent–child interaction

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Children's mental health is a critical aspect of their overall well-being, impacting their academic performance, social relationships, and life outcomes. Studies highlight the importance of parents adopting supportive and nurturing communicative strategies to share their children's emotional experiences and promote their mental well-being.

However, supporting children with emotional needs can be challenging, requiring skill and strategy for effective communication. Inexperienced parents, especially those whose children encounter emotional distress or challenges, often struggle with how to respond. A harsh and didactic approach may significantly intensify a child's negative emotions. Fortunately, parental emotion coaching (PEC) theory [1], a widely acknowledged parenting communication approach, offers a valuable framework to address these difficulties. It guides parents in validating children's emotions, eliciting empathy, and providing supportive suggestions to help them resolve problems. An example of a PEC-based conversation is shown on the left of Figure 1.

Motivated by this, we propose the development of a parental emotion coaching dialogue assistant (🐼Panda) to emulate PEC-based conversations. The goal is to provide parents with contextualized training to help them acquire or improve PEC skills. Specifically, parents can receive immediate feedback or replay conversations for post-hoc training with 🐼Panda. The generated PEC responses serve as an inspiration, demonstrating effective ways to communicate with children in various situations.

Despite the potential benefits, academic research in this area remains limited. While recent breakthroughs in large language models (LLMs) have demonstrated impressive capabilities in generating conversational responses, directly adopting them as 🐼Panda has not yielded satisfactory results (as shown on the right of Figure 1). We believe that the most direct way to address this gap is through the creation of appropriate datasets to specialize LLMs for this purpose.

To this end, we construct Peconv, a high-quality Chinese PEC-based conversation dataset, where children share their emotional experience, and parents respond using three PEC strategies: validation, empathy, and support. Since it is unrealistic to require parent–child pairs to compose conversation from scratch, as done in previous dialogue data collection workflows, we introduce a novel and efficient two-step method for high-quality PEC conversation curation. This approach leverages the exceptional generative capabilities of ChatGPT. S1: In draft generation, annotators formulate PEC-related prompts and guide ChatGPT to generate draft PEC-based conversation. S2: In human rewriting, annotators refine and improve the conversations to correct deficiencies and ensure alignment with PEC principles.

Finally, we develop 🐼Panda based on LLMs and Peconv, which consists of two main modules: the PEC responses generator (RG) and the PEC safety checker (SC). The RG module is trained on Peconv using parameter-efficient tuning methods [2], while the SC module collaboratively prevents the generating of inappropriate or socially misaligned responses. To evaluate 🐼Panda, we conducted automatic assessments, ChatGPT-based evaluation, and human interactive evaluation to comprehensively measure its performance. Furthermore, we perform extensive safety assessments, demonstrating the reliability of Peconv and 🐼Panda in assisting parents with improved parent–child interaction.

Notably, the 🐼Panda is not intended to replace real-life parental support. Instead, it serves as a valuable assistant for inexperienced parents, providing real-time feedback and suggestions while also enabling simulated and replayed conversations for post-hoc training.

In summary, our contributions are as follows. (1) To the best of our knowledge, we take the first step toward building dialogue assistants for improved parent–child interaction. (2) We construct Peconv, a Chinese PEC-based conversation dataset, using an efficient human-machine collaborative paradigm. This approach addresses a research gap in the field and offers a simple but effective framework for LLMs specialization in other domains. (3) We develop 🐼Panda, and extensive experiments and evaluations provide insights into constructing effective and safe PEC dia-

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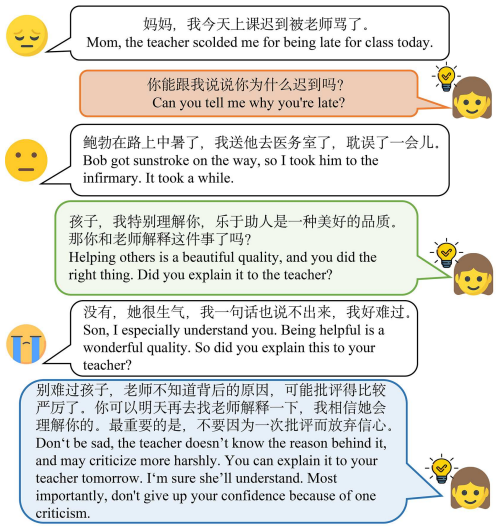

Model	Score
Bloom-7b1	5.500
Chinese-LLaMA	3.567
Baichuan2-7B-Base	6.971
ChatGPT	7.058
🐼 PANDA (Ours)	**7.952**

Figure 1 (Color online) An example of PEC-based conversation in our PECONV (left). Texts in orange, green, and blue represent the three key strategies of PEC: validation, empathy, and support, respectively. Overall scores (1–10) across five aspects, fluency, coherence, validation, empathy, and support, are compared among different LLMs (under the zero-shot setting) and our proposed 🐼PANDA trained on PECONV. The scores are evaluated by ChatGPT on 100 conversations sampled from the test set (right). Best results are in bold.

logue systems for further research.

Usage. PEC aims to teach and train parents on how to communicate more effectively with their children, especially when the child is experiencing strong emotions. These strategies include (1) validation, (2) empathy, and (3) support.

To obtain high-quality PEC-based conversations efficiently, we proposed a novel human-machine collaborative paradigm that leverages the exceptional generative capabilities of LLMs. Our pipeline consists of two steps: (1) draft generation and (2) human rewriting. For the draft generation, we employed experienced annotators with backgrounds in child psychology to prompt ChatGPT. Specifically, they design PEC-related prompts to induce ChatGPT to generate parent–child dialogues aligned with the PEC framework based on assigned topics and corresponding emotion labels. In the human rewriting phases, to address issues such as monotonous conversation flow, inflexible PEC processes, and unnatural expressions, 20 hired annotators, each with expertise in child psychology and experience interacting with children, manually refine and improve the draft conversations. This process results in a dataset of 1074 high-quality PEC conversations. Finally, we develop the dialogue assistant 🐼PANDA, which empowers parents by guiding them through PEC strategies. 🐼PANDA comprises two key components: (1) the PEC RG, which generates responses incorporating validation, empathy, and support to assist parents in PEC skills, and (2) the PEC SC, which determines whether a generated PEC response is appropriate for output. As shown in the left panel of Figure 1, our 🐼PANDA achieves superior PEC dialogue performance compared to baseline models.

To train the RG module, we use PECONV. Given the limited amount of data in PECONV, we adopt parameter-efficient tuning approaches to maximize the effectiveness of available data while minimizing resource demands. Specifically, we employ low-rank adaption (LoRA, [3]). For a linear layer $h = W_0 x$, the forward pass with LoRA is modified as follows:

$$h = W_0 x + BAx, \tag{1}$$

where $W_0 \in \mathbb{R}^{d\times k}$, $B \in \mathbb{R}^{d\times r}$, $A \in \mathbb{R}^{r\times k}$, with the rank $r \ll \min(d, k)$.

The standard negative log-likelihood is adopted as the response generation loss function:

$$L = -\sum_{t=1}^{M} \log P\left(y_t \mid D, y_{<t}\right), \tag{2}$$

where D represents the dialogue history and y_t denotes the t-th token in the target response of length M.

The SC module is designed to determine whether the RG-generated PEC response is appropriate for users. A response is deemed inappropriate if it violates any of the typical safety scenarios. At every conversational turn, SC evaluates the RG response and either allows its continuation or replaces it with a predefined security message: "The content may violate our safety policy. Please regenerate the response or rerun the whole session."

Access methods. Our PECONV and 🐼PANDA can be downloaded from https://github.com/HIT-SCIR-SC/QiaoBan.

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