AFRILANGTUTOR: Advancing Language Tutoring and Culture Education in Low-Resource Languages with Large Language Models

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Abstract

How can language learning systems be developed for languages that lack sufficient training resources? This challenge is increasingly faced by developers across the African continent who aim to build AI systems capable of understanding and responding in local languages. To address this gap, we introduce AFRILANGDICT, a collection of **194.7K** African language-English dictionary entries designed as seed resources for generating language-learning materials, enabling us to automatically construct large-scale, diverse, and verifiable student–tutor question–answer interactions suitable for training AI-assisted language tutors. Using AFRILANGDICT, we build AFRILANGEDU, a dataset of **78.9K** multi-turn training examples for Supervised Fine-Tuning (SFT) and Direct Preference Optimization (DPO). Using AFRILANGEDU, we train language tutoring models collectively referred to as AFRILANGTUTOR. We fine-tune two multilingual LLMs: Llama-3-8B-IT and Gemma-3-12B-IT on AFRILANGEDU across 10 African languages and evaluate their performance. Our results show that models trained on AFRILANGEDU consistently outperform their base counterparts, and combining SFT and DPO yields substantial improvements, with gains ranging from 1.8% to 15.5% under LLM-as-a-judge evaluations across four criteria. To facilitate further research on low-resource languages, all resources are available at https://huggingface.co/afrilang-edu.

1 Introduction

Large Language Models (LLMs) have demonstrated significant progress in downstream natural language processing (NLP) tasks, enabling human-like language understanding and data generation across diverse domains, such as education (Chu et al., 2025), medical applications (Maity and Saikia, 2025), and others (Li et al., 2025). However, their performance is heavily constrained by the volume of the specific language data on which they are pre-trained (Muennighoff et al., 2025). For low-resource languages (LRLs), limited training coverage leads to weak lexical knowledge and unreliable linguistic interpretations when models are asked to generate or explain words in those local languages (Pucinskaite and Mitkov, 2025). On the other hand, for high-resource languages (e.g., English), owing to the large volumes of pre-training data, LLMs demonstrate strong linguistic understanding and can effectively serve as language tutors in these languages (Ye et al., 2025). However, their performance as tutors in LRLs remains largely unexplored.

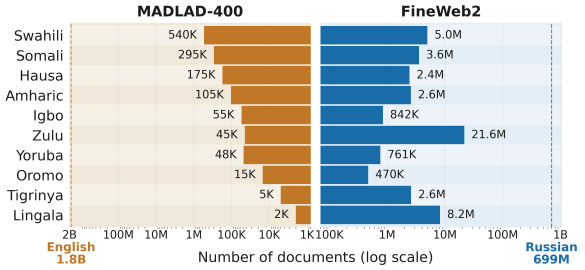

Figure 1: **Number of documents for 10 African LRLs** in two widely used pretraining corpora: MADLAD-400 (left) and FineWeb2 (right), compared with high-resource: English (1.8B) and Russian (699M).

Figure 1 compares the number of documents for 10 African LRLs with high-resource reference languages in two widely used pretraining corpora: MADLAD-400 (Kudugunta et al., 2023) and FineWeb2 (Penedo et al., 2025). African LRLs contain far fewer documents than high-resource languages such as English (1.8B in MADLAD-400) and Russian (699M in FineWeb2), and in some cases account for less than 0.01% of the English baseline. This severe imbalance highlights a fundamental limitation of multilingual pretraining corpora and underscores the difficulty of training models that generalize effectively to African LRLs.

Synthetic data generation is often proposed as a solution for data scarcity in many languages

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(de Gibert et al., 2025; Anikina et al., 2025). However, the quality of the generated content can be highly dependent on the context (prompt) or seed data used during generation (Yong et al., 2024). Structured seed resources can act as stable anchors that guide generation and improve the utility of synthetic examples. Among linguistic resources, dictionaries and bilingual lexicons are both *foundational* and relatively *accessible*, even for extremely low-resource languages, making them especially suitable as seeds for data generation (Alam et al., 2024). By using dictionary entries as a foundation for LLMs' synthetic data generation, it becomes possible to expand from individual words to phrases, sentences, and more complex linguistic structures in a controlled and reliable manner (Long et al., 2024).

In this work, we prepare new bilingual parallel dictionaries (LRLs–English) for 10 African languages called AFRILANGDICT. We then use these dictionaries to generate pedagogically useful language tutoring materials called AFRILANGEDU, using various question-and-answer templates. This *word-focused* and *context-aware* generation reduces hallucinations and produces more accurate, culturally grounded language-tutoring content.

Our work thus seeks to answer the following Research Questions (RQs): **(1)** To what extent can state-of-the-art LLMs effectively function as tutors for low-resource languages (LRLs)? **(2)** Can dictionary-based seed resources be leveraged to generate pedagogically meaningful, multi-turn tutoring dialogues across typologically diverse languages? **(3)** How effectively can dictionary-driven multilingual tutoring LLMs support scalable language learning for LRLs? **(4)** What is the effectiveness of alignment techniques, such as Supervised Fine-Tuning (SFT) (Ouyang et al., 2022), Direct Preference Optimization (DPO) (Rafailov et al., 2023), and their combination (SFT + DPO), in specializing LLMs for multilingual language tutoring? In sum, our main contributions are as follows:

- We introduce: (1) AFRILANGDICT, constituting a new dictionary of entries (194K) for 10 African languages; (2) AFRILANGEDU, comprising a new synthetic dataset (78.9K multi-turn and DPO data) that is generated using AFRILANGDICT as seed data from the state-of-the-art LLMs; and (3) AFRILANGTUTOR, open-source language tutoring LLMs trained and localized using AFRILANGEDU.
- We evaluate existing LLMs for their effectiveness as language tutors, assess alignment techniques (e.g., SFT, DPO, and SFT + DPO) across multiple evaluation metrics (e.g., automatic metrics, LLM-as-a-judge, and human evaluation), and identify significant opportunities to improve African language education.

2 Related Work

2.1 Large Language Models for Education

In recent years, LLMs have been increasingly applied in many fields, including recommendation, government, education, legal affairs, and finance (Xu et al., 2024). LLM has advanced education in many aspects, including personalized learning support (Liu et al., 2025), interdisciplinary capabilities (Liu and Zhong, 2025), real-time problem-solving and tutoring (Dinucu-Jianu et al., 2025), and broader educational knowledge coverage (Ahmad et al., 2023). Although LLMs have shown strong potential to improve teaching, change educational models, and support teachers, they still face major challenges, especially in LRL settings. These include lower performance and higher error rates in LRLs compared to high-resource languages (Maslej et al., 2025), cultural misalignment due to Western-centric training data (Tao et al., 2024), and the widening digital divide caused by limited infrastructure and computational access in the Global South (Mokoena and Seeletse, 2025).

2.2 Language Tutoring in the Era of LLMs

Dictionary-centric Approaches. Language dictionaries are a foundational resource for building language models and enabling multilingual understanding (Sakajo et al., 2025a). Bilingual dictionaries support a wide range of tasks, including enhancing rare words translation quality (Goyal and Dan, 2025), alignment methods (Gaschi et al., 2023), and cross-lingual transfer (Sakajo et al., 2025b). Additionally, Zhang et al. (2024) demonstrates that LLMs can be effectively adapted to unseen words in LRLs through in-context learning using a parallel dictionary for machine translation.

Beyond direct translation, dictionaries have been integrated into more sophisticated LLM systems to guide and constrain model behavior. Recent dictionary-augmented frameworks refine LLM queries before execution by injecting lexical and semantic priors from bilingual lexicons. These priors support several functions, including handling

#	Language (ISO)	Script	Spoken in	AfriLangDict	Multi-turn SFT	DPO	Test
1	Amharic (amh)	Ethiopic	Ethiopia, Eritrea	13,621	4,599	3,002	1,000
2	Hausa (hau)	Arabic/Latin	Northern Nigeria, Ghana, Cameroon	7,449	3,661	3,054	1,002
3	Igbo (ibo)	Latin	Southeastern Nigeria	18,992	3,697	3,584	1,032
4	Lingala (lin)	Latin	Congo, Central African	6,712	3,600	3,000	1,000
5	Oromo (orm)	Latin	Ethiopia, Somalia	15,073	3,600	3,000	1,000
6	Somali (som)	Latin	Ethiopia, Kenya, Somalia	12,577	3,600	3,000	999
7	Swahili (swa)	Latin	Tanzania, Kenya, Mozambique	27,468	3,600	2,871	1,052
8	Tigrinya (tir)	Ethiopic	Ethiopia, Eritrea	30,704	3,625	31.98	1,000
9	Yoruba (yor)	Latin	Southwestern, Central Nigeria, Togo	28,591	4,113	3,325	999
10	Zulu (zul)	Latin	South Africa	33,605	3,600	3,000	1,059
				Total = 194,792	**37,695**	**31,034**	**10,143**

Table 1: **Overview of the 10 African languages in AfriLangDict and AfriLangEdu**, including script, region, dictionary size, and the number of generated multi-turn SFT, DPO, and test instances per language.

rare and unseen words during prompting (Lu et al., 2024; Yin et al., 2024), curating higher-quality machine translation data (Yin et al., 2024), and enabling dictionary-aware prompting strategies that improve alignment between user intent and model outputs (Cao et al., 2023). Goyal and Dan (2025) introduce the International Linguistics Olympiad (IOL) benchmark by constructing parallel dictionaries and formulating translation problems in which random words or phrases from either side are presented as self-contained linguistic puzzles to evaluate the reasoning abilities of LLMs.

Overall, dictionary-based approaches offer several advantages for LLM-driven applications, particularly in low-resource settings. They help reduce hallucinations by grounding model outputs in verified lexical knowledge, filter irrelevant or noisy queries, and enable continuous improvement through user feedback and query history (Gao et al., 2024). These properties make dictionaries a powerful and practical tool for extending LLMs to LRLs and supporting culturally grounded language use.

LLMs for Language Proficiency Assessment. Recent work has demonstrated the growing role of LLMs in evaluating and supporting language learning. Xu et al. (2025) introduces the Chinese Language Teaching Evaluation (CLTE) benchmark, which assesses linguistic competence, cultural knowledge, and instructional quality in Chinese language education. Similarly, Imperial et al. (2025) propose the Multilingual UNIVERSAL-CEFR benchmark, which provides Common European Framework of Reference for Languages (CEFR) level annotations from A1 to C2 for standardized proficiency classification.

Beyond proficiency labeling, several benchmarks focus on LLMs as active language tutors. Srinivasa et al. (2025) introduces TUTORBENCH, a comprehensive evaluation framework that measures core tutoring capabilities of LLMs, including generating adaptive explanations based on student misunderstandings, providing actionable feedback on learner outputs, and promoting active learning through effective hint generation. In addition, large-scale analyses of conversational agents for language learning show that chatbots can positively impact second language acquisition (Lyu et al., 2025). Some position papers and empirical studies further argue that LLMs can serve as effective tutors in English education by complementing human instructors and mitigating limitations of traditional classroom settings (Ye et al., 2025; Karataş et al., 2024).

Despite these advances, the potential of LLMs as language tutors remains largely unexplored in pedagogically challenging, morphologically complex settings, especially for low-resource African languages learned as second languages. Our work addresses this gap by advancing multilingual AI-assisted language education systems that aim to approach the effectiveness of human instructors while supporting culturally and linguistically diverse LRL learners.

3 Dataset and Construction Details

3.1 AfriLangDict: Dictionary Collection

Among the world's 7,000 languages, 95% lack sufficient data (>100K sentences) to train LLMs (Bapna et al., 2022). However, most languages have a grammar book (60%) or a dictionary (75%) (Nordhoff and Hammarström, 2011), including many endangered low-resource languages. Dictionaries are relatively easy to obtain, even for LRLs, making them appealing candidates for

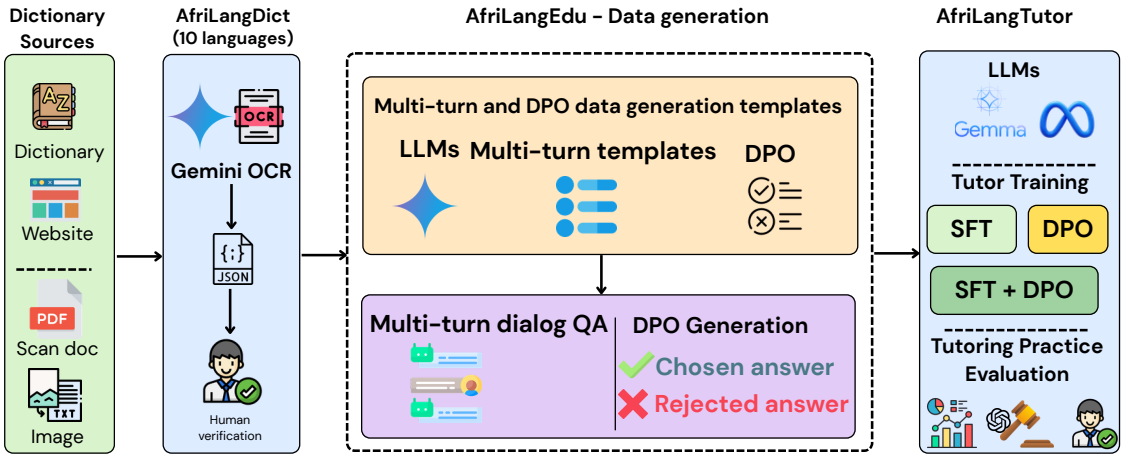

Figure 2: **Overview of the AFRILANGTUTOR pipeline.** Dictionary sources are collected and processed via OCR and human verification to construct AFRILANGDICT across 10 languages. These entries serve as seed data for synthetic generation of AFRILANGEDU, which comprises multi-turn tutoring dialogues and DPO preference pairs. Finally, Llama-3-8B and Gemma-3-12B are fine-tuned using SFT, DPO, and SFT+DPO to produce the AFRILANGTUTOR models.

many downstream NLP tasks. Therefore, we begin by collecting an African-language dictionary (AFRILANGDICT) and use these linguistic resources to enable LLMs to generate educational resources and assist with LRL tutoring.

Dictionary Sources. To create AFRILANGDICT, we draw on several sources of bilingual dictionaries. These include scanned PDF dictionaries, which we convert into a standardized machine-readable format using OCR tools such as the Google Cloud Vision API[1] and PyPDF2[2], as well as online dictionary platforms from which we scrape bilingual entries, specifically Abyssinica[3] for Amharic and IgboGuide[4] for Igbo. All extracted entries are normalized into a unified JSON format and subsequently verified by native speakers to ensure accuracy.

Language Selection. We target 10 African languages based on the availability of dictionary resources. These languages include various scripts (Latin, Arabic, Ge'ez (Ethiopic)) and language families (Afro-Asiatic: Amharic, Oromo, Hausa, Somali, Tigrinya, and Niger-Congo: Igbo, Lingala, Swahili, Yoruba, Zulu). We preprocess the dictionary entries to ensure proper Markdown formatting, preserving compatibility with special symbols, underlines, and other formatting conventions commonly found in educational materials. Finally, the dictionary entry is verified by a native speaker for each language to check correctness, alignment with English meaning, and correction of OCR errors. The train-test split began at the AfriLangDict level. Details of the languages considered, along with the statistics of AFRILANGDICT and AFRILANGEDU data (multi-turn for SFT fine-tuning, the DPO data for alignment training, and test set) are presented in Table 1. Figure 2 illustrates our general data creation pipeline.

3.2 AFRILANGEDU: Data Generation

Using AFRILANGDICT, we generate multi-turn dialogues for SFT and DPO data to align subjective preferences (for helpfulness, teaching style, and response tone optimization).

3.2.1 Multi-turn Dialog Generation

A limitation of many existing open-source datasets is that they are unstructured or consist of single-turn question-answer pairs, and they often lack natural seed data when synthetically generated, which limits diversity and can introduce bias (Rahmani et al., 2025). Unlike single-turn question-answer data, multi-turn data captures the dynamic nature of human conversations, enabling models to learn to maintain context, follow conversational flow, adapt to changes in user intent, and engage in complex interactions (Chen et al., 2025; Li et al., 2026). We generate language and culture-centered multi-turn tutoring data using AFRILANGDICT as seed data with Gemini-2.5-Pro (Comanici et al., 2025). We design multiple generation templates covering tasks such as direct question answering, contex-

[1] https://cloud.google.com/vision/docs/ocr.
[2] https://pypi.org/project/PyPDF2/.
[3] https://dictionary.abyssinica.com/.
[4] https://www.igboguide.org/HT-vocabulary.htm.

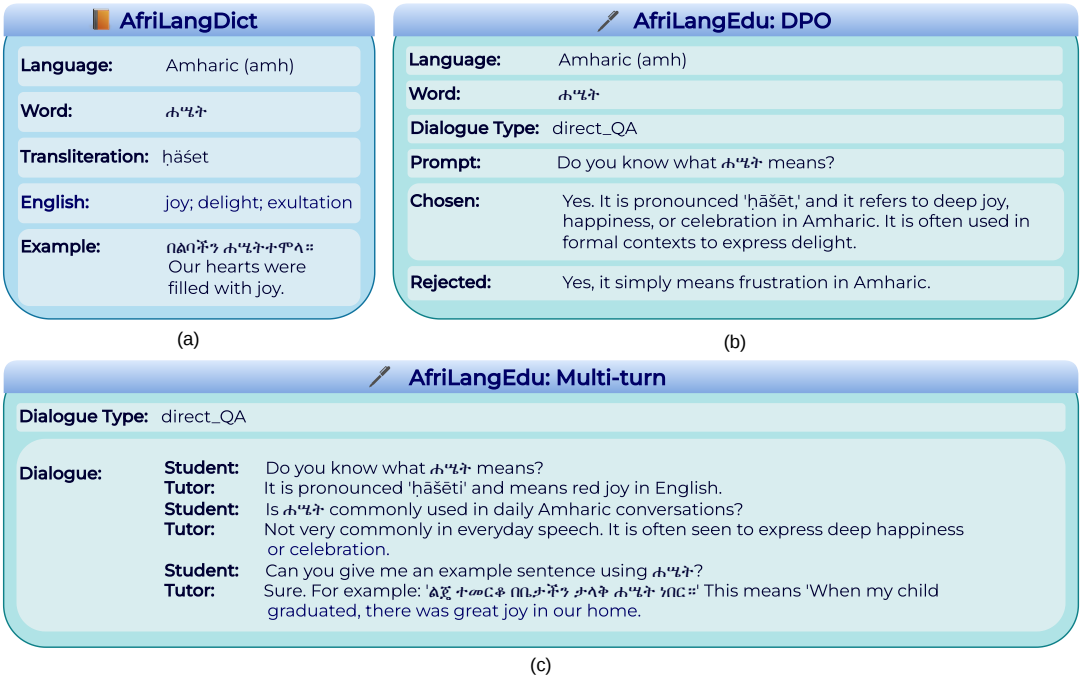

Figure 3: **Data format and examples:** (a) AFRILANGDICT dictionary format, (b) DPO data, and (c) multi-turn dialog with 3 full turns. Both (b) and (c) comprise AFRILANGEDU and are generated using AFRILANGDICT. The multi-turn responses and the chosen answer for DPO is generated using the highly performant Gemini-2.5-Pro (Comanici et al., 2025), and the rejected answer for DPO is generated using various lower LRL quality open-source LLMs of differing sizes (e.g. Llama-3 (1B, 8B) (Grattafiori et al., 2024) and Gemma-2-2B (Riviere et al., 2024)).

tual dictionary use, sentence construction, translation practice, cultural note integration, spelling and pronunciation, and more. We used this dictionary-based, generated multi-turn data for the SFT training, described in subsequent sections.

3.2.2 DPO Data Generation

Preference optimization via methods such as DPO (Rafailov et al., 2023), has been widely adopted as a standard technique for aligning LLMs with human preferences (Pant, 2025). In addition to multi-turn data, we generate DPO data with **chosen** (preferred) and **rejected** (less preferred) responses using specific pre-defined templates (details are provided in Appendix A). More specifically, the DPO training data consists of paired input–output examples that capture both correct and incorrect interactions. These pairs are constructed to reflect different combinations of query and response quality: (a) ***Correct input and response***: both the learner's query and the tutor's response are appropriate and beneficial for the language learner. (b) ***Incorrect query with correct response***: the learner's query contains linguistic or conceptual issues, but the tutor's response provides a correct explanation or correction. (c) ***Correct query with incorrect response***: the learner's query is valid, but the generated response is incorrect, misleading, or outside the intended scope. The multi-turn SFT data and the chosen responses for DPO (correct responses to both correct and incorrect queries) are generated using Gemini-2.5-Pro. The rejected responses (incorrect responses to both correct and incorrect queries) are generated using small versions of Llama-3 and Gemma-2 LLMs. An example of the data formats and structure of AFRILANGDICT and AFRILANGEDU are shown in Figure 3.

3.3 Data Quality Control

Human Validation To ensure data quality, we have had native speakers validate random samples for each language using four judgment criteria that we will also use later for LLM-as-a-judge evaluation. Following prior work that uses human verification for LLM-generated outputs, we selected 100 random samples (10% of a language test set) as a practical compromise between verification burden and confidence in data quality (Chen and Shu, 2024). As can be observed, the human validation score in Figure 4 indicates acceptable quality of the generated text.

Influence Analysis We analyze influential samples from the SFT training data based on their influence scores (Pruthi et al., 2020). Influence analysis

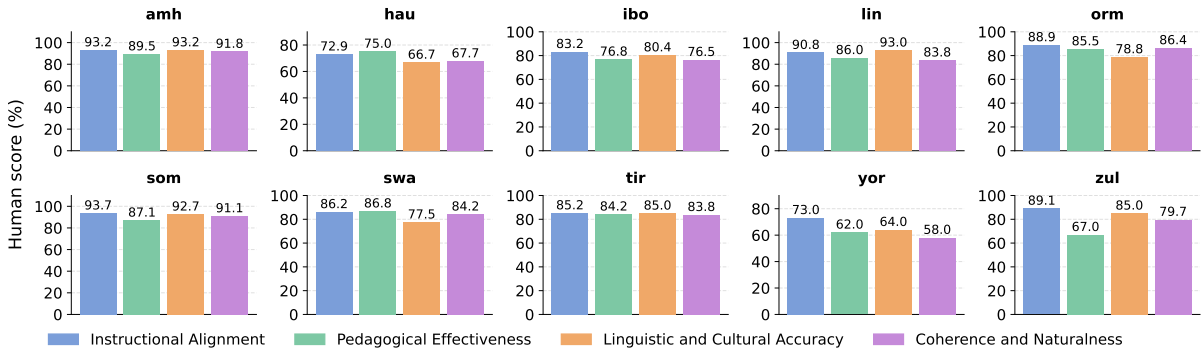

Figure 4: Human validation score (%): across four judgment criteria (details in Sec. 4.2), from $N = 100$ samples.

quantifies how individual training samples affect model predictions on a given validation set, allowing us to identify both beneficial and detrimental examples (Chhabra et al., 2024, 2025). By ranking samples according to their influence, where a positive score indicates a beneficial sample, we can prioritize high-impact data for model fine-tuning and reduce the effect of harmful examples, improving overall alignment and generalization. We performed influence analysis on our SFT dataset using the fine-tuned Llama-3-8B-IT model. The results in Section 5.2 show that all samples have positive influence scores, indicating that each sample contributes positively to the model's performance. Further details of influence analysis are provided in Appendix B.

4 Experimental Set-up

4.1 AfriLangTutor: Training LLMs

We fine-tune two open-source LLMs, Llama-3-8B and Gemma-3-12B, using SFT and DPO to develop AfriLangTutor. SFT trains the models on our multi-turn tutoring data. DPO further refines the models using pairwise preference data (i.e., *chosen* and *rejected* responses), encouraging the model to generate preferred outputs. Note that we apply SFT and DPO independently of each other, and also in combination (i.e., SFT + DPO) to better understand how each training paradigm affects downstream task performance. We fine-tune the LLMs with several varying hyperparameters and provide additional implementation details in Appendix H.

4.2 Evaluation Metrics

Automated Evaluation Metrics We use general domain-agnostic reference overlap metrics such as ChrF++ (Popović, 2017), BERTScore (Zhang et al., 2020), and ROUGE-L (Lin, 2004) as proxies to assess the coherence and human-likeness of AI tutor responses (Liu et al., 2023).

LLM-as-a-Judge In practice, language tutoring requires more than exact word matching, as commonly measured by overlap metrics (e.g. BERTScore F1, ChrF++, and ROUGE-L). A tutor may explain a concept using a valid alternative phrasing that does not match the reference answer and automated metrics, hence, unable to capture pedagogical quality or instructional usefulness. As evaluation of generated text is increasingly shifting toward LLM-as-a-judge frameworks rather than solely relying on automatic metrics (Kochmar et al., 2025), we additionally report LLM-as-a-judge evaluation results. We select **GPT-5.2** for LLM-as-a-judge because of GPT family models perform better than other LLMs in the AfroBench leaderboard (Ojo et al., 2025). We adopt the three LLM-as-a-judge evaluation criteria from Salamanca et al. (2026) and introduce a new criterion, "Pedagogical Completeness," tailored to language tutoring evaluation. Additional details are provided in Appendix C. We now provide the evaluation criteria for the LLM judge:

- *Tutoring Instruction Alignment*: Ensure that the model correctly identifies the user's specific learning intent and adheres to all task-related constraints like format, target language, and difficulty level. It prevents the tutor from providing irrelevant information or ignoring the learner's requested activity type.
- *Pedagogical Completeness*: Evaluate if the response provides a comprehensive learning package, including clear explanations, contextual examples, and supportive scaffolding. It distinguishes between a simple "correct answer" and a high-quality educational resource that guides a student toward mastery.
- *Linguistic and Cultural Accuracy*: Validate whether the language is grammatically flawless and reflects cultural authenticity. It en-

Model	amh	hau	ibo	lin	orm	som	swa	tir	yor	zul	Avg
African Language-Centric LLMs (base models)											
AfriqueGemma-4B	33.3	33.6	32.0	31.2	35.9	32.1	32.7	33.2	31.7	33.1	32.6
AfriqueLlama-8B	35.7	34.8	32.0	31.2	45.3	33.1	34.1	35.7	32.0	32.5	33.4
AfriqueGemma-12B	31.4	33.0	33.3	30.8	31.7	31.9	33.2	32.2	32.5	32.4	32.3
AfriqueQwen-14B	41.5	40.2	43.6	39.2	40.0	40.6	38.8	41.5	40.6	38.7	40.5
Open-wight LLMs (instruction-tuned)											
Gemma-2-2B	51.3	59.3	56.2	58.3	58.7	56.2	59.6	52.5	57.9	60.5	57.1
Llama-3.2-1B	44.7	52.6	51.48	51.7	53.8	51.0	50.4	46.2	51.5	53.6	50.7
Llama-3.2-3B	47.5	60.0	56.6	58.2	58.4	55.0	58.7	49.5	56.1	60.7	56.1
Aya-global-3.5B	55.9	57.2	60.0	56.2	53.8	53.5	59.6	55.2	57.3	56.9	56.6
Gemma-3-4B	53.8	55.3	54.3	56.6	54.5	54.5	57.1	54.2	54.3	55.1	55.0
Qwen3-4B	48.1	57.1	55.0	55.9	57.4	54.7	54.4	48.5	55.1	57.4	54.4
Llama-3-8B	53.0	60.2	58.6	60.7	59.5	57.1	61.0	54.2	59.5	60.6	**58.5**
Gemma-3-12B	59.9	60.8	59.1	60.0	58.2	60.6	63.2	59.4	58.5	60.0	**59.9**

Table 2: Zero-shot test-set benchmarking of LLMs for LRLs tutoring. The results are percentage results averaged across the four judging criteria as described in Section 4.2. Note that Llama-3-8B and Gemma-3-12B attain the highest zero-shot performances, and are thus used to obtain our AFRILANGTUTOR models subsequently.

sures learners are taught nuances, such as social honorifics and idiomatic expressions, that are essential for real-world communication.

- *Coherence and Naturalness*: Assess the logical flow and the professional tutoring persona, ensuring the text is organized, encouraging the learner, and easy to follow.

5 LLMs for Language Tutoring

5.1 Baselines

To assess how state-of-the-art LLMs perform as tutors for LRLs, we benchmarked the latest multilingual and open-source LLMs, including Gemma-2-2b-IT (Riviere et al., 2024), Gemma-3 (4B, 12B) (Kamath et al., 2025), Qwen3-4B (Yang et al., 2025), Llama-3 (1B, 3B, 8B) (Grattafiori et al., 2024), and Tiny-Aya-global-3.5B (Salamanca et al., 2026). In addition, we evaluate the recent African-centric LLMs such as AfriqueLLM (Gemma-(4B,12B), Llama-8B, and Qwen-14B) (Yu et al., 2026). All models are instruction fine-tuned versions for fair comparison. We selected these LLMs to facilitate efficient computation, support multilingual capabilities, and ensure reproducibility.

5.2 Benchmarking, Results, and Analysis

We first conduct zero-shot prompting as a benchmark and then in subsequent sections, aim to fine-tune the best LLMs with SFT, DPO, and SFT + DPO to create our AFRILANGTUTOR models. Using GPT-5.2 as the LLM-as-a-judge, we present zero-shot performance in Table 2. As can be observed, the African-centric LMs perform worse than the base models, and even against smaller-sized LLMs such as Llama-3.2-1B and Gemma-2-2B. We posit this is due to: 1) the domain of the training data, which includes code, mathematics, and synthetic data (Yu et al., 2026), and 2) while the AfriqueLLM models are aligned specifically with African languages during continual pre-training, our task focuses on English-centric-targeted English speaker language learning, leading to a domain mismatch. Note that the larger-sized LLMs, such as Llama-3-8B and Gemma-3-12B, tend to perform better than other lower parameter count models. Thus, we will use these in the next section for further fine-tuning. Interestingly, among the smaller LLMs, Gemma-2-2B outperforms higher-parameter models such as Llama-3.2-3B, Qwen3-4B, and Tiny-Aya-global-3.5B. We posit this might be due to more extensive training for Gemma-2-2B on multilingual data.

5.3 Improving LLMs for Language Tutoring

To improve LLMs for tutoring LRLs, we evaluate the effectiveness of training via SFT, DPO, and their combination. Here we present ChrF++ and LLM-as-a-judge (GPT-5.2) results in Table 3. Results for BERTScore and ROUGE-L as the evaluation metrics are deferred to Appendix J due to space constraints. We provide additional ablations with different fine-tuning parameters, DPO rejected response variants, and the impact of full weight and LoRA-based fine-tuning results in Appendix E. From the results obtained in Tables 3, we can ascertain the following:

Baseline LLMs vs. SFT. SFT yields a significant

Metric	Model	amh	hau	ibo	lin	orm	som	swa	tir	yor	zul	Avg
ChrF++	Llama-3-8B	25.2	25.9	26.0	26.4	25.3	25.1	26.0	24.6	25.5	25.5	25.5
	+ DPO	25.4	26.3	26.4	26.5	25.7	25.4	26.3	24.8	26.0	25.9	25.9
	+ SFT	28.0	28.0	28.3	31.0	28.0	28.5	29.1	28.2	27.7	28.5	28.5
	+ SFT + DPO	**30.57**	**29.6**	**29.9**	**32.4**	**29.4**	**30.2**	**30.7**	**29.8**	**29.3**	**29.6**	**30.0**
	Gemma-3-12B	27.1	26.3	27.8	26.7	26.7	26.5	26.9	26.9	27.2	26.3	26.8
	+ DPO	28.7	27.5	29.1	28.1	27.9	27.6	28.2	28.5	28.4	27.5	28.1
	+ SFT	34.8	33.0	34.4	35.8	33.2	33.1	34.1	34.8	33.5	32.8	34.0
	+ SFT + DPO	**36.1**	**35.1**	**36.6**	**37.6**	**35.4**	**35.9**	**36.1**	**36.1**	**35.7**	**34.7**	**35.9**
LLM-Judge	Llama-3-8B	53.0	60.2	58.6	60.7	59.5	57.1	61.0	54.2	59.5	60.6	58.5
	+SFT+DPO	**68.5**	**70.1**	**70.8**	**72.4**	**71.1**	**69.4**	**69.4**	**69.5**	**68.7**	**69.6**	**69.9**
	Gemma-3-12B	59.9	60.8	59.1	60.0	58.2	60.6	63.2	59.4	58.5	60.0	59.9
	+SFT+DPO	**63.2**	**66.9**	**68.3**	**66.8**	**64.1**	**63.9**	**65.2**	**65.7**	**66.6**	**68.2**	**65.9**

Table 3: AFRILANGTUTOR evaluation results using ChrF++ as the automated evaluation metric. **LLM-as-a-judge** results average across the four judgment criteria with GPT-5.2 as the judge.

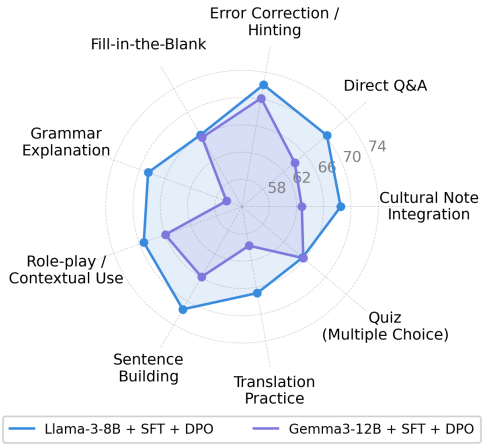

Figure 5: Performance of our AFRILANGTUTOR LLMs (Llama-3-8B-IT and Gemma-3-12B-IT post SFT + DPO fine-tuning) across different question types in our AFRILANGEDU benchmark test set.

performance leap across all 10 languages. For example, in Gemma-3-12B-IT, the baseline average of 26.82 jumps to 33.97. This demonstrates that while instruction-tuned models have cross-lingual capabilities, they suffer from a *low-resource gap* that general alignment cannot bridge. SFT with multi-turn dialogue data acts as a crucial domain adaptation step, teaching the model the specific structural nuances and tutoring style required for these languages.

SFT vs. DPO vs. SFT + DPO. Standard DPO (without a prior SFT phase) often underperforms compared to SFT alone. DPO is inherently a preference-alignment method, and not a knowledge-acquisition tool. When applied directly to a baseline that lacks sufficient language-specific grounding, the model struggles to distinguish *better* answers because its base generation quality is already low. This confirms that for low-resource language tutoring, SFT is an important *prerequisite* training step for meaningful preference learning. With performance averaged across languages post SFT + DPO, Llama-3-8B outperforms Gemma-3-12B across various query types while both models exhibit equivalent performance on *fill-in-the-blank*, and *multiple choice* queries, as shown in Figure 5. Moreover, with performance averaged across all query sample types (Table 2) both models achieve similar results.

6 Conclusion

This paper presented a comprehensive framework for improving the tutoring capabilities of LLMs in low-resource African languages. We introduced AFRILANGDICT, a 194.7K multipurpose dictionary dataset covering 10 African languages; AFRILANGEDU, a synthetic 78.9K multi-turn language tutoring dataset for SFT and DPO generated using AFRILANGDICT as seed data; and AFRILANGTUTOR, multilingual LLMs fine-tuned from Llama-3-8B and Gemma-3-12B on AFRILANGEDU. Using comprehensive evaluations with automated metrics such as ChrF++ and ROUGE-L, as well as GPT-5.2 as an LLM-as-a-judge, we demonstrated that AFRILANGTUTOR LLMs achieve state-of-the-art performance compared to base models and other open-source LLMs AfriLangTutor models can be used and integrated into language tutoring platforms.

Limitations

This work is not without limitations, and can be further extended in the following dimensions.

Multi-LLM data generation While we study ten low-resource languages in this work, there are several others that also merit study and analysis in this context. Furthermore, while our automated dataset pipeline creates high-quality multilingual, multi-turn tutoring samples using dictionary seed data, it can be further refined using the latest multilingual LLMs and extensive human annotation. Moreover, while our method helps LLMs improve as LRL tutors in English, the pipeline is limited to dictionary-based generation settings. We defer the study of these limitations to future work.

Medium of instruction language Since the current state of the art in large language models primarily targets English, most advancements and educational resources are also predominantly produced in English (Chu et al., 2025; Seo et al., 2025; Navas Bonilla et al., 2025). Accordingly, in this work, we used English as the medium of instruction when generating educational resources for low-resource languages. Our model is intended for English speakers who want to explore beginner-level new languages and cultures. As a next step, we plan to generate these educational resources directly in the target low-resource languages and evaluate the quality of LLM outputs. In the longer term, we aim to explore training multilingual tutoring models tailored to low-resource language contexts.

Advancing language tutoring While native speakers of the targeted African languages possess strong communicative competence, access to advanced linguistic education, including standardized language proficiency assessments and formal instruction, remains limited. The resources developed in this work, such as AfriLangEdu, provide a foundation to address this gap. Future work can build on these resources by generating more sophisticated linguistic data, incorporating expert-driven annotations, and developing advanced multilingual and multi-modal models tailored for high-level language tutoring and assessment.

Evaluation beyond in-house tests Most existing evaluation datasets for the targeted languages focus on non-dialogue-based interactions and skills such as scientific or mathematical reasoning, which do not align with this work's objectives. There is no language learning-related test dataset available for AfriLangTutor models. Additionally, many of these benchmarks are not designed for generative tasks but rather for classical tasks such as classification and translation. Evaluate AfriLangTutor for other non-language-teaching tasks, which may be explored in the future.

Ethics Statement

This work aims to support language learning and accessibility for low-resource languages that are underrepresented in NLP research. The AFRILANGDICT dataset is derived from various publicly available dictionary entries, ensuring no personal or sensitive data is included. While the automated generation of the AFRILANGEDU dialogue dataset allows for scalable resource creation, we acknowledge the inherent risk of large language models introducing grammatical errors, hallucinations, or cultural inaccuracies, particularly in low-resource contexts. To mitigate this, we conducted a random-sampled manual evaluation with native speakers to verify the quality and appropriateness of the generated educational dialogues. The resulting datasets and AFRILANGTUTOR models will be publicly released under open licenses to foster transparency and equitable access. We encourage future users to consider local linguistic nuances when deploying these models in real-world educational settings.

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Appendix

A Data Generation Templates

Below are examples of generating templates with descriptions. We generate at least 3 full turns (3 from the language learner and the tutor's answers).

1. **Direct Q&A**: Simple student–tutor explanation of a word (phrase or sentence) meaning.
2. **Quiz (Multiple Choice)**: language learner and the tutor interact in a question-and-answer conversation.
3. **Fill-in-the-Blank**: A contextual sentence with a missing word.
4. **Role-play / Contextual Use**: Greeting, school, or conversation simulation.
5. **Error Correction / Hinting**: The student asks, and the tutor corrects the student's misunderstanding.
6. **Sentence Building**: The language learner (student) asks the tutor to build a sentence, and the tutor creates a complete sentence using the word.
7. **Translation Practice**: Forward and backward translation check.
8. **Spelling & Pronunciation**: Language transliteration or phonetic spelling practice and spelling correction.
9. **Cultural Note Integration**: Explanation of cultural or contextual relevance.
10. **Grammar Explanation**: The student asks about a grammar rule involving the target word, and the tutor provides a clear and simple explanation with examples.

For DPO training, by adding chosen and rejected features from the data, enabling the model to learn answering styles in various negative example scenarios from both the language learner (student) and language teacher (tutor) perspectives. Some examples of such cases for the DPO setting are presented below:

1. **Misspelled / Typo**: The student attempts to ask about the target word but makes a significant spelling error (e.g., swapping letters, omitting vowels, or using phonetic spelling).
2. **Vague / Ambiguous**: The student provides insufficient context or is unclear about their intent (e.g., typing only the word or asking "What about this?" without specifying the target).
3. **Irrelevant / Mixed Context**: The student mixes the language-learning question with an unrelated topic (e.g., Python code, weather prediction, or general knowledge).
4. **Factually Wrong Premise**: The student asks a question based on a confidently stated false assumption (e.g., "Since [WORD] means [WRONG_MEANING], can I use it to describe a river?").
5. **Out-of-Scope / Nonsensical**: The student asks for inappropriate usage (e.g., how to use the [WORD] as an insult) or poses impossible questions about abstract words (e.g., "What color is this verb?").

B Influence Analysis

We use TraceIn (Pruthi et al., 2020) as the influence function for calculating the influence score between training and validation samples, thereby ensuring computational efficiency (Askari et al., 2025; Vitel and Chhabra, 2026). Let, the fine-tuned LLM parameterized by θ_L. The influence score between a training sample x_i^t and a validation sample x_j^v can be defined as:

$$\text{Influence}(x_i^t, x_j^v) = \nabla_{\theta_L} \ell(x_i^t, \theta_L) \cdot \nabla_{\theta_L} \ell(x_j^v, \theta_L) \quad (1)$$

where $\ell(\cdot, \theta_L)$ is the cross-entropy loss.

Here, A positive influence score indicates that x_i^t reduces the loss on x_j^v, suggesting a beneficial effect, while a negative score indicates a harmful influence. In our experiments, we found that most training samples have a positive influence. Figure 6 shows the distribution of the average influence scores of training samples over the validation set, illustrating that the majority of training samples contribute beneficially.

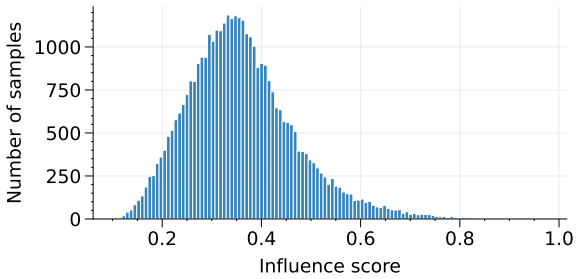

Figure 6: Average influence score distribution of the SFT training samples.

C LLM Judge Prompt Templates

Table 4 is the full prompt template for the LLM-as-a-judge evaluation across the four evaluation criteria (instructional alignment, pedagogical completeness, linguistic and cultural accuracy, and coherence and naturalness).

D Human vs. LLM Judgment Agreement

Figure 7 shows a comparison of Human (native speakers) and LLM (GPT-5.2) evaluation scores across ten African languages using four evaluation dimensions on 100 samples. The score comparison reveals notable differences between Human and LLM-based evaluation across languages. Human evaluators consistently assign higher scores than the LLM in most evaluation dimensions, especially in Pedagogical Effectiveness and Linguistic Accuracy, suggesting that the LLM may underestimate pedagogical quality and cultural-linguistic nuances in multilingual educational responses. In contrast, the gap between Human and LLM evaluations is comparatively smaller for Coherence and Naturalness, indicating stronger agreement on fluency-related aspects. Language-specific variations are also evident, where languages such as Amharic (amh), Somali (som), and Oromo (orm) achieve relatively high Human scores across all dimensions, while languages such as Yoruba (yor) and Zulu (zul) exhibit more discrepancies between Human and LLM assessments. Overall, the results highlight both the potential and limitations of LLM-based automatic evaluation for culturally diverse languages.

E Additional Ablation Results

Table 5 shows additional ChrF++ results from different fine-tuning settings.

LoRA vs. Full SFT Full SFT (28.93) slightly outperforms SFT with LoRA (28.48) in the Llama-3 experiments. While LoRA is parameter-efficient and prevents catastrophic forgetting, Full SFT allows the model to undergo more significant representational shifts. In low-resource scenarios where the model needs to learn a new script or complex morphology, the additional degrees of freedom in full SFT provide a marginal but consistent advantage.

DPO vs. Self-DPO Self-DPO (where the rejected answer is from the model itself) underperforms compared to using an external rejected model. For Llama + SFT, DPO[2] (the rejected is from Gemma-2-2b-it) is significantly better than the result from self DPO. This suggests that in low-resource contexts, "self-critique" is limited by the model's own lack of knowledge. Using a diverse set of rejected answers from other LLMs (like Gemma-2-2b) provides a clearer contrastive signal, helping the model identify and avoid a wider variety of linguistic errors.

F Benchmark Result Details from LLM-as-a-judge Evaluation

Table 6 shows the benchmark results from the LLM-as-a-judge Evaluation. The rubric scaling results are in converted % from 100 for the ease of understanding.

G Benchmark Result Details (rating)

Table 7 shows the LLM-judge rating result details across benchmarked LLMs.

H Fine-tuning Hyperparameter Details

We fine-tune the LLMs with different fine-tuning parameters, the default (β 0.1, batch size 1, epoch

LLM Judge Prompt Template

You are a skilled language tutoring evaluator tasked with judging the quality of a generated language teaching answer for a given query. Instruction: Score the answer generated by a system to a user's request on a Likert scale (1, 3, 5, 7) for four quality criteria. Include a concise rationale for each score in less than 50 words (in English). Rubric: (1) Instruction Alignment
7: The response shows a perfect understanding of the user's intent. It follows all instructions, including task type (e.g., dialogue), formatting, and specific language constraints.
5: The response addresses the user's core question and follows most instructions, but may have minor slips in formatting or include slightly extraneous information.
3: The response only partially understands the user's intent. It might answer the question but fail to follow the requested format (e.g., providing a list when a dialogue was asked for) or omit a key constraint.
1: The response completely misses the user's intent, answers a different question, or fails to follow any of the structural instructions provided.
(2) Pedagogical Completeness
7: Provides a comprehensive learning "package": a clear explanation of the concept, multiple relevant examples, and a practice prompt or "scaffolding" that guides the learner to the next level.
5: Generally helpful for learning; provides an answer and an explanation, but the examples might be a bit generic or the scaffolding could be more structured.
3: Limited educational value. It might give the correct answer but offer a poor or overly brief explanation, leaving the learner without a clear understanding of the "why."
1: Pedagogically useless. Just gives the answer without any explanation or context, or provides misleading pedagogical advice that would confuse a student.
(3) Linguistic & Cultural Accuracy
7: The language is flawless and sounds like a native speaker. It includes relevant cultural nuances (e.g., proper Amharic honorifics or social context) that make the language feel real and usable.
5: Grammatically correct with very minor slips. It is culturally acceptable but might rely on slightly formal or "textbook" phrasing that isn't commonly used in daily life.
3: Contains several grammatical or spelling errors. It may use literal translations that are technically "correct" but socially awkward or culturally weird in the target language.
1: Pervasive linguistic errors that distort meaning. The response is culturally insensitive or uses "hallucinated" grammar that would teach the learner incorrect habits.
(4) Coherence & Naturalness
7: Perfectly organized with smooth transitions. The tone is encouraging, professional, and engaging. It reads like high-quality material from a professional language school.
5: Logical and easy to follow, though it may feel a bit mechanical. The tone is polite and professional, with minor gaps in the "flow" of conversation.
3: Noticeable issues in organization. The transitions between the explanation and the examples are clunky, or the tone feels inconsistent (e.g., shifting from overly formal to too casual).
1: Disjointed and difficult to follow. Ideas are disconnected, and the tone is either robotic, rude, or completely inappropriate for a tutoring environment.
Response Format (Strict JSON):
{{
"instruction_following_rationale": "...", "instruction_alignment_score": SCORE,
"pedagogical_completeness_rationale": "...", "pedagogical_completeness_score": SCORE,
"linguistic_cultural_accuracy_rationale": "...", "linguistic_cultural_accuracy_score": SCORE,
"coherence_and_naturalness_rationale": "...", "coherence_and_naturalness_score": SCORE
}}
Question: {question}

Candidate: {candidate}

Table 4: Prompt details of the LLM-as-a-judge evaluation.

3) and the cthe default (β 0.1, batch size 1, epoch 3) and the custom ($\beta = 0.5$, batch size 4, epoch 10) from LlamaFactory[5] LLM fine-tuning framework. We also make a full fine-tuning and fine-tuning with LORA settings. β is a standard beta parameter used for DPO (Rafailov et al., 2023). We studied the impact of training parameters such as beta, batch size, and the number of epochs in our work.

Fine-tuning Parameter Effects. Higher parameter values consistently outperforms the default. Low-resource alignment is sensitive to fine-tuning hyper-parameters. The superiority of higher parameters

[5] https://github.com/hiyouga/LlamaFactory

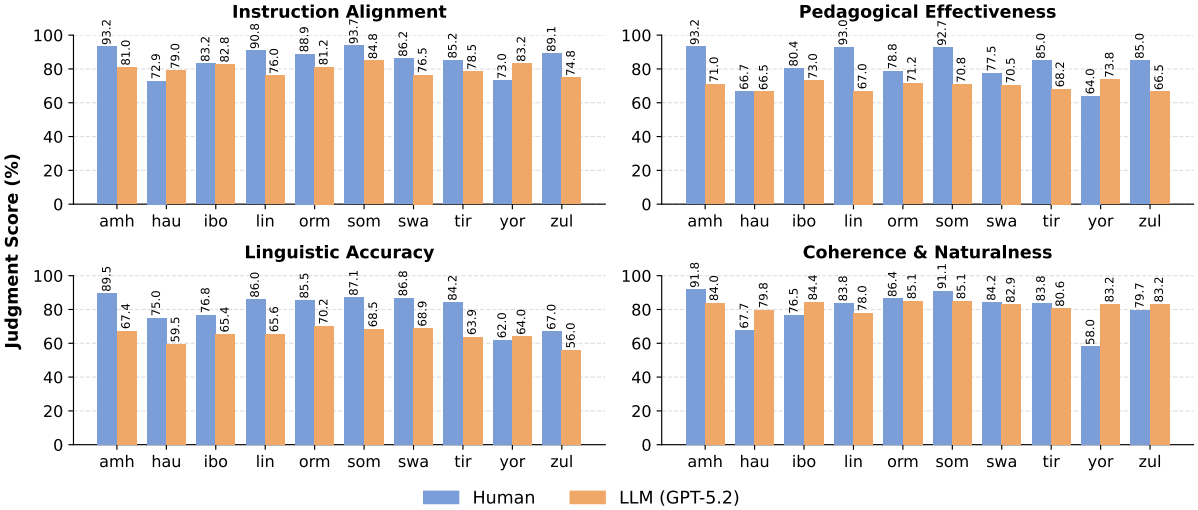

Figure 7: Human vs LLMs (GPT-5.2) judgment agreement score (%) across four judgment criteria, the 10 targeted languages, from $N = 100$ samples in the test set.

Table 5: ChrF++ results with different settings. For the DPO experiment, the chosen answer is from Gemini 2.5 pro and the rejected answer is generated from Llama-3.1-8B-Instruct[1], Gemma-2-2b-it[2], and **self** DPO (the DPO rejected answer is generated from Llama-3-8B-IT itself). Param[1] = β 0.1, batch size 1, epoch 3, and Param[2] = β 0.5, batch size 4, epoch 10. SFT is with LORA, and FULL SFT is full fine-tuning.

Model	amh	hau	ibo	lin	orm	som	swa	tir	yor	zul	Avg
Llama-3-8B-IT	25.17	25.87	25.96	26.35	25.33	25.05	25.97	24.56	25.48	25.51	25.52
+ DPO[1]	21.41	21.80	22.77	22.28	19.74	20.94	22.21	20.01	21.86	19.78	21.29
+ DPO[2]	28.37	29.88	30.20	30.67	29.82	29.43	30.48	27.95	30.01	29.05	29.59
+ DPO[1] + Param[1]	21.41	21.80	22.77	22.28	19.74	20.94	22.21	20.01	21.86	19.78	21.29
+ DPO[1] + Param[2]	24.90	25.61	25.69	25.87	24.93	24.81	25.59	24.02	24.97	25.15	25.15
+ DPO[2] + Param[1]	28.37	29.88	30.20	30.67	29.82	29.43	30.48	27.95	30.01	29.05	29.59
+ DPO[2] + Param[2]	25.40	26.29	26.41	26.50	25.70	25.40	26.30	24.81	25.96	25.93	25.87
+ SFT	28.03	27.98	28.25	30.98	27.98	28.54	29.05	28.17	27.66	28.51	28.48
+ SFT (influence 90%)	28.20	27.49	28.56	28.25	28.24	30.70	27.69	28.72	27.99	28.97	28.45
+ FULL SFT	28.45	28.32	28.94	31.72	28.56	28.90	28.87	28.79	28.39	28.66	28.93
+ SFT + DPO[self]	24.91	25.70	25.47	27.21	24.93	25.75	25.88	25.03	24.78	25.56	25.5
+ FULL SFT + DPO[self]	23.27	23.55	23.76	26.30	23.38	23.90	24.36	23.59	23.00	23.50	23.83
+ SFT + DPO[1]	28.05	27.99	27.89	30.61	27.79	28.54	28.82	28.12	27.46	28.19	28.32
+ SFT + DPO[2]	29.57	29.60	29.90	32.41	29.37	30.21	30.69	29.80	29.33	29.62	**30.02**
Gemma-3-12B-IT	27.05	26.27	27.76	26.68	26.65	26.45	26.86	26.93	27.19	26.27	26.82
+ DPO[1]	27.50	26.79	28.20	27.02	27.05	26.71	27.11	27.46	27.53	26.67	27.22
+ DPO[2]	28.65	27.50	29.05	28.06	27.88	27.60	28.15	28.52	28.38	27.49	28.14
+ SFT	34.84	32.99	34.43	35.82	33.23	33.15	34.08	34.75	33.45	32.80	33.97
+ SFT (influence 90%)	34.95	33.78	34.68	33.18	34.55	35.94	31.96	33.37	33.54	34.22	34.02
+ SFT + DPO[1]	35.52	33.53	35.43	36.22	34.08	34.57	35.06	35.41	34.79	33.72	34.85
+ SFT + DPO[2]	**36.08**	**35.02**	**36.62**	**37.55**	**35.42**	**35.87**	**36.06**	**36.01**	**35.67**	**34.71**	**35.90**

suggests that more intensive training is necessary to overcome the high loss associated with unfamiliar language data. A lower parameter, such as β (0.1), likely causes the model to diverge too quickly or fail to learn the preference signal effectively. The detail parameter ablations and results are in the Appendix E. However, the parameter with full fine-tuning is computationally very expensive.

I Additional Results across Dialog Types

Table 8 shows results across dialog types.

J Additional Automatic Evaluation Metric Results

Table 9 shows results from automatic evaluation metrics (BERTScore, ChrF++, and ROUGE-L).

Table 6: LLM Judge detail results from GPT 5.2. The results are the Rubric criteria of LLM judgment converted to 100%. The details of the instruction templates are in Appendix C.

Model	Judge Criteria	amh	hau	ibo	lin	orm	som	swa	tir	yor	zul	Avg
Llama-3.2-1B-IT	Instruction alignment	57.6	64.7	66.8	66.9	67.5	66.0	64.9	59.2	65.3	67.1	64.6
	Pedagogical completeness	38.7	45.8	43.4	42.0	43.8	41.6	42.2	40.3	43.4	44.2	42.5
	Linguistic & Cultural Accuracy	28.1	34.9	33.8	35.9	38.5	34.7	33.8	28.8	35.2	37.9	34.2
	Coherence & Naturalness	54.4	65.0	61.9	62.1	65.4	61.8	60.5	56.6	62.2	65.1	61.5
		44.7	52.6	51.48	51.7	53.8	51.0	50.4	46.2	51.5	53.6	50.7
Gemma-2-2b-it	Instruction alignment	63.2	69.2	66.0	68.5	68.3	66.7	69.6	64.6	68.8	68.8	67.4
	Pedagogical completeness	48.4	54.6	52.6	52.7	52.2	51.3	55.2	49.5	53.0	53.0	52.3
	Linguistic & Cultural Accuracy	34.4	44.1	43.0	43.4	45.4	41.7	44.7	36.0	44.3	49.3	42.7
	Coherence & Naturalness	59.0	69.2	63.2	68.6	69.0	64.9	68.8	60.0	65.4	70.8	65.9
		51.3	59.3	56.2	58.3	58.7	56.2	59.6	52.5	57.9	60.5	57.1
Llama-3.2-3B-IT	Instruction alignment	58.3	69.8	70.5	71.7	68.3	67.9	71.4	60.2	68.2	70.7	67.7
	Pedagogical completeness	35.0	44.6	45.9	43.6	40.9	42.1	46.7	35.4	43.9	44.4	42.3
	Linguistic & Cultural Accuracy	39.3	54.8	43.5	49.1	54.9	45.2	49.2	42.9	46.5	56.7	48.2
	Coherence & Naturalness	57.2	70.8	66.4	68.5	69.4	64.6	67.3	59.4	65.9	70.8	66.0
		47.5	60.0	56.6	58.2	58.4	55.0	58.7	49.5	56.1	60.7	56.1
Aya-global-3.5B	Instruction alignment	67.9	70.6	71.6	69.6	67.8	67.5	71.1	66.7	69.7	69.8	69.2
	Pedagogical completeness	52.7	51.0	55.6	50.4	44.5	47.8	54.2	52.1	49.9	50.0	50.8
	Linguistic & Cultural Accuracy	40.7	41.2	45.2	38.4	39.2	36.0	44.6	38.8	44.1	41.4	41.0
	Coherence & Naturalness	62.4	66.1	67.4	66.2	63.5	62.6	68.4	63.1	65.4	66.4	65.2
		55.9	57.2	60.0	56.2	53.8	53.5	59.6	55.2	57.3	56.9	56.6
Gemma-3-4b-IT	Instruction alignment	66.1	67.7	67.3	69.2	67.4	68.4	69.3	66.0	67.2	68.3	67.7
	Pedagogical completeness	53.1	54.5	53.2	55.4	53.3	53.3	56.4	53.4	53.5	54.2	54.0
	Linguistic & Cultural Accuracy	38.4	38.4	38.9	39.0	36.8	36.7	40.3	39.4	38.7	36.6	38.3
	Coherence & Naturalness	57.5	60.4	57.7	62.7	60.5	59.4	62.5	58.0	57.9	61.4	59.8
		53.8	55.3	54.3	56.6	54.5	54.5	57.1	54.2	54.3	55.1	55.0
Qwen3-4B-IT	Instruction alignment	60.3	65.8	65.5	68.3	66.0	65.5	66.5	60.7	65.6	66.7	65.1
	Pedagogical completeness	46.9	51.7	52.1	51.4	51.9	50.6	49.9	47.6	50.6	51.0	50.4
	Linguistic & Cultural Accuracy	33.8	49.5	43.0	42.9	48.6	43.7	42.9	34.2	45.5	49.1	43.3
	Coherence & Naturalness	51.4	61.3	59.3	60.8	63.2	59.1	58.1	51.5	58.6	62.7	58.6
		48.1	57.1	55.0	55.9	57.4	54.7	54.4	48.5	55.1	57.4	54.4
Llama-3-8B-IT	Instruction alignment	68.2	70.8	72.3	74.6	72.1	71.1	73.3	69.7	71.8	72.2	71.6
	Pedagogical completeness	48.8	51.4	52.2	51.6	48.5	49.3	53.2	50.0	51.7	50.8	50.8
	Linguistic & Cultural Accuracy	32.7	47.7	41.5	45.2	46.8	40.5	47.3	33.3	45.2	47.7	42.8
	Coherence & Naturalness	62.4	70.8	68.5	71.5	70.6	67.5	70.3	63.6	69.2	71.6	68.6
		53.0	60.2	58.6	60.7	59.5	57.1	61.0	54.2	59.5	60.6	58.5
Gemma-3-12B-IT	Instruction alignment	69.7	72.1	69.0	71.8	68.2	71.2	73.2	69.6	68.8	71.6	70.5
	Pedagogical completeness	57.4	59.0	56.8	57.9	56.4	58.8	60.9	57.0	56.9	58.3	57.9
	Linguistic & Cultural Accuracy	49.9	47.2	50.2	45.3	44.4	49.0	52.5	49.0	47.4	45.5	48.0
	Coherence & Naturalness	62.4	64.9	60.4	65.1	63.7	63.3	66.2	62.0	60.9	64.5	63.2
		59.9	60.8	59.1	60.0	58.2	60.6	63.2	59.4	58.5	60.0	59.9
AfriqueGemma-4B	Instruction alignment	38.8	40.9	36.8	37.4	39.9	37.0	38.2	39.1	36.7	39.9	38.5
	Pedagogical completeness	28.7	29.6	28.8	27.4	28.9	28.1	28.5	28.7	28.4	28.7	28.6
	Linguistic & Cultural Accuracy	36.9	34.3	33.8	32.2	35.7	34.7	35.0	36.5	32.9	34.8	34.7
	Coherence & Naturalness	28.9	29.7	28.7	27.6	29.2	28.4	29.0	28.5	28.6	28.9	28.7
		33.3	33.6	32.0	31.2	33.4	32.1	32.7	33.2	31.7	33.1	32.6
AfriqueLlama-8B	Instruction alignment	42.6	42.7	37.0	37.0	40.4	39.5	40.5	42.4	37.0	38.7	39.8
	Pedagogical completeness	30.3	31.9	29.0	28.4	30.3	29.6	30.2	30.5	29.1	29.4	29.9
	Linguistic & Cultural Accuracy	39.1	34.3	33.1	31.5	35.2	34.7	36.6	39.2	33.3	32.9	35.0
	Coherence & Naturalness	30.6	30.3	28.8	27.8	29.1	28.7	29.3	30.8	28.6	28.8	29.3
		35.7	34.8	32.0	31.2	33.8	33.1	34.2	35.7	32.0	32.5	33.5
AfriqueGemma-12B	Instruction alignment	34.1	36.7	36.6	33.7	34.6	35.0	36.4	35.3	35.6	35.8	35.4
	Pedagogical completeness	28.6	30.0	29.6	27.7	28.7	29.0	29.4	29.4	29.3	28.9	29.1
	Linguistic & Cultural Accuracy	34.2	34.2	37.1	33.0	34.6	34.5	36.8	34.9	35.4	35.1	35.0
	Coherence & Naturalness	28.8	30.9	29.8	28.7	28.9	29.2	30.0	29.2	29.7	29.9	29.5
		31.4	33.0	33.3	30.8	31.7	31.9	33.2	32.2	32.5	32.4	32.3
AfriqueQwen-14B	Instruction alignment	50.3	48.3	52.5	48.3	47.2	48.3	45.2	51.0	48.4	46.2	48.6
	Pedagogical completeness	36.1	34.8	36.9	33.5	34.7	35.0	34.2	36.2	35.3	34.1	35.1
	Linguistic & Cultural Accuracy	39.4	35.6	39.5	34.4	37.2	37.5	35.5	39.5	36.4	34.3	36.9
	Coherence & Naturalness	40.0	41.9	45.4	40.5	40.8	41.7	40.1	39.2	42.5	40.3	41.2
		41.5	40.2	43.6	39.2	40.0	40.6	38.8	41.5	40.7	38.7	40.5

Table 7: LLM Judge rating Results by Language and LLM. The rating classes are in the Rubric across the four judging criteria (1. Instruction Alignment Score, 2. Pedagogical Completeness Score, 3. Linguistic Cultural Accuracy Score, and 4. Coherence and Naturalness Score), and the rating values are either 1, 3, 5, or 7. The average for the corresponding languages is also presented at the end of each LLM (below the dashed line).

Model	Judge Criteria	amh	hau	ibo	lin	orm	som	swa	tir	yor	zul	Avg
Llama-3.2-1B-IT	Instruction Alignment	3.61	4.17	4.34	4.35	4.40	4.28	4.19	3.74	4.23	4.37	4.17
	Pedagogical Completeness	2.09	2.66	2.47	2.36	2.50	2.33	2.37	2.23	2.47	2.53	2.40
	Linguistic Cultural Accuracy	1.25	1.79	1.70	1.88	2.08	1.78	1.70	1.30	1.81	2.03	1.73
	Coherence And Naturalness	3.35	4.20	3.95	3.96	4.24	3.94	3.84	3.53	3.97	4.21	3.92
		2.56	3.21	3.12	3.14	3.31	3.08	3.03	2.70	3.12	3.29	3.06
Gemma-2-2b-it	Instruction Alignment	4.06	4.54	4.28	4.48	4.47	4.34	4.57	4.17	4.50	4.50	4.39
	Pedagogical Completeness	2.87	3.37	3.20	3.22	3.18	3.10	3.42	2.96	3.24	3.24	3.18
	Linguistic Cultural Accuracy	1.75	2.52	2.44	2.47	2.63	2.34	2.58	1.88	2.54	2.95	2.41
	Coherence And Naturalness	3.72	4.54	4.06	4.49	4.52	4.20	4.50	3.80	4.23	4.66	4.27
		3.10	3.74	3.50	3.67	3.70	3.50	3.77	3.20	3.63	3.84	3.56
Llama-3.2-3B-IT	Instruction Alignment Score	3.66	4.59	4.64	4.74	4.47	4.43	4.71	3.82	4.45	4.65	4.42
	Pedagogical Completeness Score	1.80	2.57	2.67	2.49	2.28	2.37	2.74	1.83	2.51	2.55	2.38
	Linguistic Cultural Accuracy Score	2.14	3.39	2.48	2.93	3.39	2.62	2.94	2.43	2.72	3.54	2.86
	Coherence And Naturalness Score	3.58	4.66	4.31	4.48	4.55	4.17	4.38	3.75	4.27	4.66	4.28
		2.80	3.80	3.53	3.66	3.67	3.40	3.69	2.96	3.49	3.85	3.49
Aya-global-3.5B	Instruction Alignment Score	4.43	4.65	4.73	4.57	4.42	4.40	4.68	4.34	4.58	4.59	4.54
	Pedagogical Completeness Score	3.21	3.08	3.45	3.03	2.56	2.82	3.34	3.17	2.99	3.00	3.07
	Linguistic Cultural Accuracy Score	2.25	2.30	2.62	2.07	2.14	1.88	2.57	2.10	2.53	2.31	2.28
	Coherence And Naturalness Score	3.99	4.29	4.39	4.30	4.08	4.01	4.47	4.05	4.23	4.32	4.21
		3.47	3.58	3.80	3.49	3.30	3.28	3.77	3.42	3.58	3.56	3.53
Gemma-3-4b-IT	Instruction Alignment Score	4.29	4.41	4.39	4.53	4.39	4.47	4.55	4.28	4.38	4.46	4.42
	Pedagogical Completeness Score	3.25	3.36	3.26	3.43	3.27	3.26	3.51	3.27	3.28	3.33	3.32
	Linguistic Cultural Accuracy Score	2.07	2.07	2.11	2.12	1.95	1.94	2.22	2.16	2.10	1.93	2.07
	Coherence And Naturalness Score	3.60	3.83	3.61	4.01	3.84	3.75	4.00	3.64	3.63	3.91	3.79
		3.30	3.42	3.34	3.52	3.36	3.36	3.57	3.34	3.35	3.41	3.40
Qwen3-4B-IT	Instruction Alignment Score	3.83	4.26	4.24	4.46	4.28	4.24	4.32	3.85	4.25	4.34	4.21
	Pedagogical Completeness Score	2.75	3.13	3.17	3.11	3.15	3.05	2.99	2.81	3.05	3.08	3.03
	Linguistic Cultural Accuracy Score	1.70	2.96	2.44	2.43	2.88	2.50	2.43	1.74	2.64	2.93	2.47
	Coherence And Naturalness Score	3.12	3.90	3.74	3.86	4.05	3.72	3.65	3.12	3.69	4.02	3.69
		2.85	3.56	3.40	3.47	3.59	3.38	3.35	2.88	3.41	3.59	3.35
Llama-3-8B-IT	Instruction Alignment Score	4.45	4.67	4.78	4.97	4.77	4.69	4.86	4.58	4.75	4.78	4.73
	Pedagogical Completeness Score	2.91	3.11	3.18	3.13	2.88	2.94	3.25	3.00	3.14	3.06	3.06
	Linguistic Cultural Accuracy Score	1.61	2.82	2.32	2.62	2.74	2.24	2.78	1.67	2.62	2.82	2.42
	Coherence And Naturalness Score	3.99	4.67	4.48	4.72	4.65	4.40	4.62	4.09	4.54	4.73	4.49
		3.24	3.82	3.69	3.86	3.76	3.57	3.88	3.34	3.76	3.85	3.68
Gemma-3-12B-IT	Instruction Alignment Score	4.58	4.76	4.52	4.75	4.45	4.70	4.86	4.57	4.51	4.73	4.64
	Pedagogical Completeness Score	3.59	3.72	3.54	3.63	3.51	3.70	3.87	3.56	3.55	3.66	3.64
	Linguistic Cultural Accuracy Score	2.99	2.77	3.01	2.62	2.55	2.92	3.20	2.92	2.80	2.64	2.84
	Coherence And Naturalness Score	3.90	4.19	3.83	4.21	4.09	4.06	4.30	3.96	3.87	4.16	4.06
		3.77	3.86	3.73	3.80	3.65	3.85	4.06	3.75	3.68	3.80	3.80
AfriqueGemma-4B	Instruction Alignment Score	2.11	2.28	1.94	1.99	2.19	1.96	2.06	2.13	1.94	2.19	2.08
	Pedagogical Completeness Score	1.29	1.37	1.30	1.19	1.32	1.25	1.28	1.30	1.27	1.29	1.29
	Linguistic Cultural Accuracy Score	1.95	1.74	1.70	1.58	1.85	1.77	1.80	1.92	1.63	1.78	1.77
	Coherence And Naturalness Score	1.32	1.37	1.29	1.21	1.33	1.27	1.32	1.28	1.28	1.31	1.30
		1.67	1.67	1.56	1.49	1.67	1.56	1.61	1.66	1.53	1.64	1.66
AfriqueLlama-8B	Instruction Alignment Score	2.41	2.42	1.96	1.96	2.23	2.16	2.24	2.39	1.96	2.10	2.18
	Pedagogical Completeness Score	1.42	1.55	1.32	1.27	1.42	1.36	1.42	1.44	1.33	1.36	1.39
	Linguistic Cultural Accuracy Score	2.13	1.74	1.65	1.52	1.82	1.78	1.93	2.14	1.66	1.63	1.80
	Coherence And Naturalness Score	1.45	1.42	1.30	1.22	1.33	1.30	1.35	1.46	1.29	1.30	1.34
		1.95	1.78	1.56	1.49	1.70	1.65	1.74	1.81	1.56	1.60	1.83
AfriqueGemma-12B	Instruction Alignment Score	1.72	1.94	1.93	1.70	1.77	1.80	1.92	1.83	1.85	1.86	1.83
	Pedagogical Completeness Score	1.29	1.40	1.36	1.22	1.30	1.32	1.35	1.35	1.34	1.31	1.32
	Linguistic Cultural Accuracy Score	1.73	1.74	1.96	1.64	1.77	1.76	1.94	1.79	1.83	1.81	1.80
	Coherence And Naturalness Score	1.30	1.47	1.38	1.29	1.31	1.33	1.40	1.34	1.37	1.40	1.36
		1.51	1.64	1.66	1.46	1.54	1.55	1.65	1.58	1.60	1.59	1.60
AfriqueQwen-14B	Instruction Alignment Score	3.03	2.87	3.20	2.86	2.78	2.86	2.62	3.08	2.87	2.70	2.88
	Pedagogical Completeness Score	1.89	1.78	1.95	1.68	1.78	1.80	1.73	1.90	1.83	1.73	1.81
	Linguistic Cultural Accuracy Score	2.15	1.85	2.16	1.75	1.98	2.00	1.84	2.16	1.92	1.75	1.95
	Coherence And Naturalness Score	2.20	2.35	2.63	2.24	2.27	2.33	2.21	2.14	2.40	2.23	2.30
		2.57	2.46	2.49	2.38	2.45	2.50	2.35	2.57	2.50	2.43	2.49

Table 8: Resulst across Dialog types from our best model: Llama-3-8B + SFT + DPO and Gemma3-12B + SFT + DPO.

Dialog type	**amh**	**hau**	**ibo**	**lin**	**orm**	**som**	**swa**	**tir**	**yor**	**zul**	**Avg.**
Llama-3-8B + SFT + DPO Results											
Cultural Note Integration	67.19	69.22	68.55	69.27	69.61	67.65	66.63	70.21	66.9	68.83	68.48
Direct Q&A	68.75	71.57	69.58	73.00	73.44	69.9	68.84	67.6	69.62	70.83	70.27
Error Correction / Hinting	70.31	71.45	74.29	76.09	73.58	70.83	71.31	71.57	71.32	70.74	72.16
Fill-in-the-Blank	62.21	67.57	67.37	68.02	68.45	66.44	63.96	65.76	65.44	67.36	66.17
Grammar Explanation	65.45	69.24	67.52	71.93	70.56	68.13	69.64	66.15	66.07	71.11	68.67
Role-play / Contextual Use	67.46	67.80	71.09	70.31	71.58	67.13	69.16	70.56	68.30	69.39	69.34
Sentence Building	68.87	72.5	73.46	72.8	71.94	72.55	72.48	67.61	70.77	70.35	71.38
Translation Practice	63.98	66.83	71.94	70.09	68.75	66.56	65.33	67.16	66.83	62.87	66.87
Quiz (Multiple Choice)	63.02	66.69	65.14	68.30	69.56	63.31	65.91	64.55	62.80	66.27	65.61
Irrelevant/wrong question inputs											
Irrelevant / Mixed Context	70.40	69.25	71.57	72.19	71.84	69.77	68.81	68.24	68.53	68.64	69.93
Misspelled / Typo	67.42	70.25	69.96	71.7	71.91	69.9	68.88	69.78	68.1	69.29	69.67
Factually Wrong Premise	71.91	74.44	74.38	76.55	74.21	71.31	73.11	72.39	73.5	71.88	73.39
Out-of-Scope / Nonsensical	72.99	71.15	71.32	72.56	71.17	71.43	72.46	73.49	70.01	72.39	71.98
Vague / Ambiguous	68.39	70.7	72.24	75.08	73.07	71.73	71.45	69.19	68.86	71.16	71.1
Average	68.58	70.14	70.88	72.41	71.66	69.41	69.46	69.48	68.79	69.61	70.03
Gemma3-12B + SFT + DPO Results											
Cultural Note Integration	61.59	62.97	62.09	64.45	65.75	63.27	61.83	63.83	59.52	61.62	62.78
Direct Q&A	61.72	66.54	63.02	62.75	66.50	67.22	68.56	62.12	58.65	64.09	64.09
Error Correction / Hinting	68.39	70.88	69.74	72.83	72.05	71.40	70.08	66.79	69.53	69.13	70.17
Fill-in-the-Blank	62.02	63.68	67.80	67.29	66.77	66.17	67.29	63.80	66.27	65.69	65.72
Grammar Explanation	53.98	54.90	57.48	58.33	58.33	58.45	55.02	55.38	56.10	55.31	56.43
Role-play / Contextual Use	61.51	66.98	66.41	67.68	66.41	65.97	70.90	62.22	63.84	67.35	65.99
Sentence Building	62.38	65.52	66.56	64.47	67.69	66.03	70.16	65.34	63.91	66.35	65.90
Translation Practice	57.24	58.17	60.20	59.15	61.66	59.87	65.15	60.80	57.98	56.90	59.81
Quiz (Multiple Choice)	65.89	67.11	66.53	63.24	67.59	66.55	66.82	66.52	64.88	60.73	65.74
Irrelevant/wrong question inputs											
Irrelevant / Mixed Context	65.93	67.19	65.56	67.26	68.61	63.52	67.46	63.07	62.86	66.46	65.82
Misspelled / Typo	61.75	66.19	64.14	66.35	69.14	66.50	66.76	63.34	64.68	64.70	65.30
Factually Wrong Premise	68.94	73.62	70.68	73.21	75.67	73.69	75.91	67.37	70.73	71.52	72.01
Out-of-Scope / Nonsensical	65.41	71.51	69.79	72.72	71.52	72.39	73.94	67.08	65.38	71.30	70.13
Vague / Ambiguous	60.76	67.32	65.07	63.47	67.00	68.15	67.46	61.81	64.57	63.78	65.01
Average	63.19	66.64	65.66	66.92	68.29	66.79	68.24	63.87	64.08	65.23	65.90

Table 9: Evaluation results using automatic evaluation metrics across the baseline LLMs and various fine-tuning settings such as DPO, SFT, and SFT + DPO. The DPO rejected is generated from Gemma-2-2B.

Model	Metrics	amh	hau	ibo	lin	orm	som	swa	tir	yor	zul	Avg
Llama-3.2-3B	BERTScore F1	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
	ChrF++	25.17	25.87	25.96	26.35	25.33	25.05	25.97	24.56	25.48	25.51	25.52
	ROUGE-L	0.18	0.17	0.17	0.18	0.17	0.17	0.18	0.18	0.17	0.17	0.17
Llama-3.2-3B + DPO	BERTScore F1	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
	ChrF++	28.37	29.88	30.20	30.67	29.82	29.43	30.48	27.95	30.01	29.05	29.59
	ROUGE-L	0.20	0.20	0.20	0.20	0.20	0.19	0.20	0.21	0.20	0.19	0.20
Llama-3.2-3B + SFT	BERTScore F1	0.87	0.88	0.88	0.89	0.88	0.88	0.88	0.88	0.87	0.88	0.88
	ChrF++	28.03	27.98	28.25	30.98	27.98	28.54	29.05	28.17	27.66	28.51	28.48
	ROUGE-L	0.26	0.26	0.26	0.29	0.26	0.27	0.27	0.27	0.26	0.26	0.27
Llama-3.2-3B +SFT+DPO	BERTScore F1	0.88	0.88	0.88	0.89	0.88	0.88	0.88	0.88	0.87	0.88	0.88
	ChrF++	30.23	30.21	30.87	33.28	30.45	30.78	30.72	30.84	30.19	30.55	30.79
	ROUGE-L	0.26	0.26	0.26	0.29	0.26	0.27	0.27	0.27	0.26	0.26	0.27
Gemma3-12B	BERTScore F1	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
	ChrF++	27.05	26.27	27.76	26.68	26.65	26.45	26.86	26.93	27.19	26.27	26.82
	ROUGE-L	0.17	0.16	0.17	0.17	0.16	0.16	0.17	0.17	0.17	0.16	0.17
Gemma3-12B+DPO	BERTScore F1	0.84	0.84	0.84	0.85	0.84	0.84	0.85	0.85	0.84	0.84	0.84
	ChrF++	28.65	27.50	29.05	28.06	27.88	27.60	28.15	28.52	28.38	27.49	28.14
	ROUGE-L	0.17	0.16	0.17	0.17	0.16	0.16	0.17	0.17	0.17	0.16	0.17
Gemma3-12B+SFT	BERTScore F1	0.87	0.87	0.87	0.88	0.88	0.87	0.88	0.87	0.87	0.87	0.87
	ChrF++	34.84	32.99	34.43	35.82	33.23	33.15	34.08	34.75	33.45	32.80	33.97
	ROUGE-L	0.24	0.26	0.25	0.27	0.26	0.26	0.26	0.25	0.25	0.24	0.26
Gemma3-12B+SFT+DPO	BERTScore F1	0.87	0.87	0.87	0.88	0.87	0.87	0.88	0.87	0.87	0.87	0.87
	ChrF++	36.08	35.02	36.62	37.55	35.42	35.87	36.06	36.01	35.67	34.71	35.90
	ROUGE-L	0.24	0.25	0.25	0.26	0.25	0.25	0.25	0.24	0.25	0.23	0.25