

Language Evaluation of an AI Tutor to Support Secondary Science Students in Seychelles Creole

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1. Introduction

Situated just south of the equator in the Indian Ocean, Seychelles presents a rich tapestry of cultural, historical, and linguistic dynamics shaped by its colonial past and current socio-economic realities. Although classified as a high-income country since 2015, this smallest African nation continues to face many language and education challenges common to postcolonial contexts across the continent. This paper explores the use of artificial intelligence (AI) in education in Seychelles. AI platforms, particularly ChatGPT, have demonstrated significant potential for enhancing educational outcomes. The integration of generative AI technologies into science education is both inevitable and expected to grow, given AI's deep integration into daily life and its expanding applications across various fields (Chang et al., 2023, p.69).

The first language of over 90% of the population is Kreol Seselwa, a French-lexifier Creole. In public schools, Kreol Seselwa serves as the medium of instruction (MoI) during the first two years of education. From Primary Grade 3 onwards, however, the MoI abruptly shifts to English (Deutschmann and Zelime, 2022). Requiring students to study technical subjects in a second language presents substantial challenges. When students are expected to engage with technical content in a language other than their first language (L1), they must not only grasp the subject matter but also translate unfamiliar terms into their mother tongue (Nyika, 2015). Furthermore, assessing students in a second language (L2) may not accurately reflect their true understanding or the knowledge they could have demonstrated if taught in their L1 (Barrett et al., 2024; Clegg, 2007). Language barriers in education can undermine academic equity, particularly in science, where mastery of technical terminology is crucial.

This article presents a preliminary evaluation of the effectiveness of the GPT-4 API (the application programming interface behind the ChatGPT platform) in facilitating science communication in Kreol Seselwa. Specifically, we examine the potential of an AI chatbot to tutor secondary-school students whose first language is Kreol Seselwa. This is the second study of its kind for this language, following an earlier investigation into the use of GPT-4 for mathematics tutoring in Seychelles at the primary level (Butgereit, Pejakovic and Athanase, 2024). A web-based tutoring bot was developed by the third author to interact in Kreol Seselwa, with support from the organization acknowledged in this paper.

The evaluation was conducted by the first and second authors – Seychellois linguist and education researcher at the University of Seychelles, and a mathematics educator and policy analyst at the Ministry of Education, respectively. Both are native speakers of Kreol Seselwa.

The following research questions informed this pre-pilot study:

- ◆ RQ1: How effectively can the AI tutor communicate secondary-level science concepts in Kreol Seselwa to students who may have not attained English proficiency?
- ◆ RQ2: What language challenges arise when using an AI tutor in Kreol Seselwa for science education?
- ◆ RQ3: How does the AI tutor's use of Kreol Seselwa influence students' engagement with secondary science content?

2. Background

2.1 The evolution of Kreol Seselwa

Kreol Seselwa, was codified in the early 1980s, marking a significant step in standardizing its written form and promoting its status as a recognized language. In 1982, Seychelles became the first nation in the world to introduce a Creole language as MoI; this was implemented for pre- and early-primary schooling and is still the case today (Deutschmann and Zelime, 2022). While English continues to expand its significant role in areas such as administration, education, and media, the influence of French has been consistently declining (Hoareau, 2010). Kreol Seselwa is not only linked to community and cultural communications, but is used in the legislative assembly, political arena and in the media. Even if it is spoken by the vast majority of the local population, the stigma of it being a relatively inferior language persists to this day (Deutschmann and Zelime, 2021; D'Offay De Rieux, 1980; Purvis, 2004).

Kreol Seselwa remains mutually intelligible with Mauritian Creole (from which it developed in the eighteenth century) and shares linguistic similarities with several other French-lexifier Creole varieties such as Haiti and Dominica (Laversuch, 2008). Studies undertaken on the dynamics of language contact in Seychelles confirm the prevalence of code-switching between English and Kreol Seselwa (Pejakovic, 2016, 2021; Vel, 2021). As remarked by Pejakovic (2021) the Seychellois successfully draw on their bilingual lexicon to achieve a variety of discourse functions, including the creation of pragmatic and rhetorical meaning. Additionally, in Seychelles online forums, the growing use of Chatspeak/sms-type writing is observed, particularly in the discourse of the younger generation. Chatspeak means that words are almost systematically shortened, for example *Mon pa konen* 'I am not going' > *Mn p knn*. With 83% of the Seychelles population having access to a smartphone (National Bureau of Statistics, 2022), linguistic creativity is evident

in digitally mediated communications.

2.2 A brief overview of education in Seychelles

The Seychelles education system follows an education-for-all policy, entailing 11 years of compulsory schooling, which typically ranges from ages six to 16. The Ministry of Education closely oversees and regulates the system, which is highly exam-focused (Purvis, 2020, p.49). Secondary education is compulsory for a minimum of four years and a maximum of five (Purvis, 2020, p.47). The final examinations in take place in Secondary Grade 5, where the top-performing students take the IGCSE exams, administered by Cambridge International (Deutschmann and Zelime, 2021, p.64). Education in the Seychelles National Curriculum (2001b) is structured for all public schools and is organized into six progressive achievement levels. These include three primary cycles: Cycle 1 (Crèche to P2), Cycle 2 (P3 to P4), and Cycle 3 (P5 to P6) in addition to two secondary cycles: Cycle 4 (S1 to S2) and Cycle 5 (S3 to S4). In Cycle 1, the medium of instruction for science is Creole, while English is introduced as the language of instruction from Cycle 2 onwards (Jules and Conner, 2009, p.21).

In Seychelles public schools, the science curriculum is structured as follows:

- 1) *Key Stage 1 (Crèche to Primary 2): students are introduced to basic scientific concepts through exploratory activities.*
- 2) *Key Stage 2 (Primary 3 and Primary 4): the curriculum builds on foundational knowledge, emphasising observation and simple experiments.*
- 3) *Key Stage 3 (Primary 5 and Primary 6): students engage in more structured scientific inquiries, preparing them for secondary-level science.*
- 4) *Key Stage 4 (Secondary 1 to Secondary 3): students study integrated science, which combines elements of biology, chemistry, physics and earth science.*
- 5) *Key Stage 5 (Secondary 4 and Secondary 5): students have the option to specialise in individual science subjects, including physics, chemistry, and biology, allowing for in-depth study in preparation for further education or careers in scientific fields*

(Ministry of Education, 2015)

As in other contexts, the curriculum in Seychelles serves multiple purposes. One of its key objectives is to advance a 'hegemonic agenda' (Jules and Conner, 2009, p.21), grounded in the belief that acquiring scientific knowledge, skills, and values enhances students' confidence and scientific literacy. This, in turn, empowers them to make informed decisions that support sustainable environmental, social, and economic development (Ministry of Education, 2001a).

However, there is evidence that many students are not fully conversant with science concepts by the time they transition to secondary school. Over the past decade, science results in Seychelles' public secondary schools have shown a largely downward

trend. Between 2010 and 2020, educational attainment in state schools declined, particularly in the percentage of students achieving Grade C or higher in STEM subjects in both national (Primary 6) and international examinations (IGCSE). Although modest improvement has been observed since 2020, which coincides with a drop in the number of exam candidates, concerns remain about the long-term implications for education and the development of expertise in the country (Nolan, 2022). These findings suggest that science education at the primary level requires targeted interventions to improve comprehension and foster greater interest in the subject.

2.3 Education challenges

Language transition is not without its problems in Seychelles, with the abrupt shift of MoI from the L1 (Kreol Seselwa) to the L2 (English) in grade three (Deutschmann and Zelime, 2022; Purvis, 2020). The educational framework's heavy reliance on English may not fully support optimal comprehension in science education in public schools where students may not have fully attained L2 proficiency (Deutschmann and Zelime, 2022; Purvis, 2020). In most schools, English is the primary language of instruction for science subjects, and learning complex concepts in a second or third language increases these challenges, particularly for students from lower socio-economic backgrounds who may have limited exposure to English outside of the classroom. In keeping with Rollnick, (1998, p.123), Zelime and Deutschmann (2019, p.7) highlight that 'a monolingual approach to L2 MoI learning may also have large adverse effects on the teachers' opportunities to provide scaffolding for understanding school knowledge'. This challenge extends beyond science to locally-contextualized subjects such as social studies, mathematics and science, where 'drawing on examples from real life is often necessary to illustrate complex concepts'. The authors are also critical of the dominant focus on formal, structural aspects of English grammar in English instruction, which effectively entails prioritizing the teaching of 'proper' written English over developing the skills needed to fully comprehend and engage with other subjects taught in English. The educational attainment decline is of course influenced by other factors, notably teacher proficiency (Leste and Benstrong, 2011; Purvis, 2020).

Several studies from sub-Saharan Africa support the effectiveness of using a mixed-language strategy in education – particularly approaches involving translanguaging and code-switching. In a South African study, Rollnick (1988) found that such strategies helped address misconceptions about air pressure by facilitating group communication, whereas English-only instruction yielded only partial success. In Kenya, Cleghorn (1992) reported that students better understood key concepts when teachers did not strictly adhere to an English-only policy. Similarly, a study in Lesotho by Khalema and Raselimo (2024) explored students' and teachers' views on code-switching in geography education, concluding that it enhances comprehension by improving proficiency in subject-specific terminology.

In multilingual contexts across sub-Saharan Africa, where educational language policies are often complex, additive multilingual education (MLE) has shown promise. Unlike subtractive bilingualism – as is currently the case in Seychelles – additive MLE builds on students’ existing linguistic resources by integrating local languages alongside instruction in a second language (L2) (Erling et al., 2017). Within this framework, pedagogical translanguaging provides structured multilingual teaching strategies, while fluid translanguaging allows for more spontaneous and unrestricted use of multiple linguistic resources (Cenoz and Gorter, 2021; García, 2009; Makalela, 2019, as cited in Deutschmann et al., 2024).

However, some scholars argue that fluid approaches may hinder students’ access to standardized language varieties required for higher education and employment (Heugh and Stroud, 2020). To mitigate this, functional multilingualism has been proposed, which promotes flexible language use while ensuring competence in at least one standardized language. A notable application of this is language-supportive pedagogy (LSP) in science education, which blends L1 scaffolding with structured L2 instruction (Clegg and Milligan, 2021). Deutschmann and Zelime (2021) and Deutschmann et al. (2024) argue that using students’ native language to teach foundational concepts – followed by a gradual transition to English at higher levels – can lead to improved science learning outcomes. They propose that additive multilingual models, which employ both the L1 and L2 as media of instruction, offer a promising approach (ibid., p.74).

In most contexts, where there is a change of MoI, curricula as well as teaching and learning materials are designed under the assumption that students are already proficient in the new language of instruction (Barrett et al., 2024, p.12). Nevertheless, as Purvis (2020, p.49) notes, the adequate resourcing of mother-tongue teaching remains a challenge in Seychelles, particularly given the cost of sustaining the local production of good-quality materials on a very small scale. This challenge is compounded by the need for further development in teacher training, especially in first-language methodology. Even if Kreol Seselwa is formally recognized as a support language in the curriculum framework, code-switching is at best, inconsistently practiced in the classroom. At worse, there is evidence of it being actively discouraged (Zelime and Deutschmann, 2019). It is also worth noting that the number of non-Seychellois teachers employed in Seychelles is steadily growing. The figure currently stands at 18% (Gappy, 2023), with the vast majority working in secondary schools. With the rise in non-Seychellois educators, opportunities for translanguaging and code-switching are becoming less available to students.

After-school tutoring has proven to be an effective strategy for supporting students’ academic success. This is confirmed by White et al. (2022) who synthesize findings from 40 studies, examining how tutoring is implemented and experienced across different contexts. Effective tutoring generally assumes that the student has already received some prior instruction in the subject and is able to ask reasonable questions to seek further help (Butgereit et al., 2024). Seychellois students receive less than optimal assistance with their

homework. In a study by Leste and Benstrong (2011), it was found that less than half of Seychellois students received parental support with their homework – a figure significantly below the global average of 73-77% (Dolton et al., 2018); although, as students reach their secondary years, many parents feel less adept in supporting them, particularly with technical subjects. This lack of parental support may contribute to the growing reliance on private tuition, with a quarter of Seychellois students reportedly receiving privately paid extra lessons (Leste and Benstrong, 2011). In view of the financial implications of private tuition, coupled with parents' diminishing ability to assist their children with homework as they enter the secondary years, a cheap or free and accessible tutoring service would no doubt be useful, in the current context.

2.4 AI in education

AI is transforming education by offering personalized learning, immediate feedback, and support for self-directed study. Serban et al. (2020) highlight AI's ability to personalize content, improving learning outcomes and making education more inclusive. Real-time feedback helps students refine their understanding, promoting an iterative learning process. Socratic tutoring, based on Socratic philosophy, focuses on dialogue and questioning to cultivate critical thinking. It promotes higher-order skills like analysis, evaluation, and synthesis by encouraging students to explain their reasoning. Le (2019) notes that Socratic questioning enhances comprehension and metacognition, helping students assess their thought processes.

Even if the concept of Artificial Intelligence was first proposed by Alan Turing in 1950 (Turing, 1950) and the expression first used in 1956, it was the development of large language models and OpenAI's release of chatGPT in late 2022 (OpenAI, 2022) that opened the public's eye to how AI could be used in education. Commercial tutoring organizations such as the Khan Academy (Khan Labs, 2023) and Duolingo (Duolingo, 2023) rushed to release commercial versions of their apps which were augmented by artificial intelligence.

Earlier research into the use of artificial intelligence in education by Ouyang and Jiao (2021) had identified three paradigms of usage. Paradigm One was AI-directed usage where the student was merely a recipient of information provided by the AI. In this first paradigm, the AI was just a type of teaching machine which provided learning materials without any consideration to the students' skills and abilities. Paradigm Two was AI-supported usage where the student and the AI collaborated together. In this second paradigm, the AI could provide an individualized learning path for the student. Paradigm Three was AI-empowered usages where the student became the leader in his or her own learning journey and the AI empowered this learning.

In search of examples of this AI-empowered usage, Butgereit and Abugosseisa (2024) searched the conversational log files of a university-level mathematics tutoring bot they

had deployed in the Arabic language in Sudan during internal armed conflict. This tutoring bot utilized OpenAI's GPT-4 which was the latest underlying application programming interface (API) at that point in time – OpenAI, 2023. They found numerous examples of this GPT-4 powered tutoring bot which empowered the university students to take more control over their own mathematics education. This was especially important in a war situation where universities were closing and many students were becoming refugees. Students were empowered to continue with their own mathematics education in the most difficult situations. As a language, the history of Arabic is dramatically different from the history of Kreol Seselwa. Arabic has been a written language since the advent of Islam in the early 7th century CE (Versteegh, 2014). This plethora of written material provided good training data for GPT-4 and the Arabic abilities of GPT-4 were quite remarkable.

Kreol Seselwa does not have such a long history and, therefore, there were far fewer documents written in Kreol Seselwa that could be used as training material for GPT-4. Prior research by the authors in attempting to tutor mathematics in Kreol Seselwa highlighted some language issues (Butgereit et al., 2024). In 2024, OpenAI released GPT-4o and OpenAI promised that GPT-4o would have ‘...significant improvement on text in non-English languages...’ (OpenAI, 2024). The research described in this paper provides good opportunities to test both the tutoring abilities of GPT-4o and the language abilities.

3. Theoretical framework

The theoretical framework for this study is Stephen Krashen's Input Hypothesis (Krashen, 1985), which is part of his broader Second Language Acquisition Theory. The ‘acquired system’ or ‘acquisition’ develops through a subconscious process akin to how children learn their first language. It relies on meaningful interaction in the target language – natural communication – where speakers focus on conveying meaning rather than the form of their utterances. Although developed for language acquisition, this theory can be adapted to explore how ChatGPT could function as a tutor in science education. The Input Hypothesis posits that students acquire knowledge when exposed to input slightly beyond their current level of understanding – referred to as ‘i+1’. This input must be comprehensible yet sufficiently challenging to promote gradual growth, in a low-stress environment (‘low-affective filter’). Using a chatbot tutor can serve as a practical application of Krashen's Input Hypothesis in several ways:

1. ChatGPT could adjust its responses to the students’ level and needs, offering input tailored to be slightly beyond their current understanding. Through conversational engagement, ChatGPT might provide new vocabulary or academic concepts, ensuring that the language and content remain both comprehensible and appropriately challenging (i+1). It is expected that ChatGPT will be able to guide students through increasingly complex content, building on foundational knowledge. The sequential nature of language acquisition – where foundational

structures are acquired before advanced ones – parallels the way scientific concepts can be introduced and mastered. For instance, when teaching about electromagnets, it could start with basic concepts like the properties of magnets before introducing more advanced ideas like magnetic fields and electric currents. The principle of scaffolding knowledge should be effectively supported by a ChatGPT tutor, which can be utilized both in school and at home. By providing explanations, examples and support, ChatGPT should ensure that students are positively challenged without feeling overwhelmed.

2. As an interactive platform, ChatGPT could facilitate meaningful communication – a key component of comprehensible input. Students would be able to ask questions, receive explanations, and participate in dialogue, using language in authentic, contextually rich scenarios. When adapted to science education, ChatGPT could contextualize concepts such as electromagnetism, using relatable examples and step-by-step explanations.
3. ChatGPT should be able to offer instant corrections or suggestions when students make mistakes, allowing them to notice gaps in their understanding. This immediate feedback could encourage students to internalize correct forms and concepts, aligning with Krashen's idea that acquisition occurs through exposure to accurate and progressively advanced input.
4. As a large language model trained on diverse data, ChatGPT could expose students to a variety of language uses, including formal and informal styles, different registers, and discipline-specific terminology. This diversity could help students acquire a richer, more nuanced understanding of both language and content.

4. Methodology

4.1 Study design

This small-scale, exploratory study employed a combination of qualitative methods: user testing, language analysis and interviews with participants. The study involved a sample of five participants to trial the software and evaluate its potential. The reason for this small number is that the AI chatbot is a commercial product with limited access for external testing. The company has not made it widely available, restricting broader participant recruitment. Authors 1 and 2 interacted with the web-based tutoring bot, asking science questions tailored for young students. Detailed information on the data collection process is provided in Section 4.3.

Screenshots from the user-testing sessions were analysed to examine the AI tutor's language use and adaptability in Kreol Seselwa and science communication analysis – to evaluate the clarity and effectiveness of the tutor's explanations of scientific concepts. Additionally, three interview sessions were conducted to gather qualitative

insights from: i) a science educator, ii) two secondary year one students, and iii) two secondary year four students.

This pre-pilot study included only five participants, as it served as a preparatory phase for a more extensive pilot project. Insights from this phase will guide efforts to secure project funding for a broader rollout in Seychelles. If the larger pilot proceeds, ethics approval will be sought, and the tutoring bot will transition to a WhatsApp interface, enabling students to access it on their personal mobile devices. It is to be noted that the AI tutor provides a personalized service that is different to regular Chat GPT. It offers Socratic questioning, guiding students to discover answers rather than providing them outright, while also promoting deeper reflection and personalized, scaffolded learning. While the prototypical, generative ChatGPT can come up with redundant or erroneous information (i.e. 'hallucinate'), the AI chatbot tutor is intentionally configured with educational information. For this study, it was set up by Author 3 as a Physics tutor, specifically by 'feeding' it curriculum-aligned content on electricity, circuits, magnets and states of matter.

The pre-pilot study design directly addresses the three research questions (outlined in Section 1) through a combination of methods, as follows:

- ◆ RQ1: User testing, language, science communication analysis, and participant interviews provided data on how effectively the AI tutor communicates secondary-level science concepts in Kreol Seselwa to students with limited English proficiency.
- ◆ RQ2: Language and science communication analyses identified specific language challenges, which were further confirmed or complemented by insights from interview discussions.
- ◆ RQ3: User testing and interviews explored the impact of the AI tutor's use of Kreol Seselwa on student engagement with secondary science content.

Interview questions were aimed at understanding participants' experiences with the AI tutor, including its ability to convey science concepts, address language challenges and maintain student engagement. The questions were as follows:

Questions for the educator

1. What are your initial thoughts on the AI tutor's effectiveness in explaining science/physics concepts?
2. How accurate is the AI tutor in translating science/physics terminology and concepts into Kreol?
3. Do the translated explanations and instructions remain clear and understandable?

Questions for the students

1. What are your initial thoughts on the AI tutor's effectiveness in explaining science/physics concepts?

2. How accurate is the AI tutor in translating science/physics terminology and concepts into Kreol?
3. Do the translated explanations and instructions remain clear and understandable?
4. Do you prefer getting science/physics tutoring help in Kreol or English, and why?
5. Does the AI tutor make learning science/physics more engaging for you?

4.2 Tutoring bot setup

The actual tutoring bot was hosted on a platform owned and operated by a startup based in Cape Town, South Africa. The configuration of the tutoring bot included such items as the prompt for interacting with GPT-4, the configuration of the access methods (such as a Whatsapp interface and/or a web interface, and/or a Telegram interface), and white-listed mobile phone numbers in the case of a Whatsapp and Telegram interface. At the point in time of this research, the ‘assistant’ facility and ‘persistent threads’ as offered by the OpenAI/ChatGPT platform were not used. They may be used in future iterations of this research.

4.3 Data collection

Data collection involved two methods facilitated by the first and second author conducted in September 2024. An interview was held with an educator of the Ministry of Education and with a small group of students from Ile Perseverance Secondary School, on the main island of Mahe. There were four students interviewed, evenly distributed by grade level and gender, with two participants each from Secondary One and Secondary Four. Separate interview sessions were held for each grade to ensure discussions were tailored to their educational contexts. The authors used the AI chatbot to ask science-related questions, suitable for young students, assessing the language generated and consumed by GPT-4. The interviews were conducted following participants’ interactions with the AI tutor, which delivered instructions on physics topics within the science curriculum. All discussions were audio recorded and transcribed to enhance the reliability and validity of the data. The results and conclusions of this evaluation are detailed in sections 5 and 6.

4.4 Ethical considerations

Ethics approval was obtained from the University of Seychelles’ Research Ethics Committee for collecting data from the participants. The attainment of permission and parental consent were secured through the principal of the school where the students are enrolled, via the Ministry of Education protocols. The educator, being a colleague of the second author was approached directly by the latter.

5. Findings

5.1 Language evaluation

This component involved language evaluation of the chatbot interactions by the first author. The objective was to critically assess the semantic accuracy and grammatical correctness of the chatbot's responses to questions posed by both students and the educator. Overall, most of the translation was semantically correct, with a few exceptions. Translation shortcomings were apparent with Kreol Seselwa terms, such as *lema* 'magnet', *kwiyer* 'spoon' and *bar feray* 'metal rod'. The AI tutor was advised of the right terminology during the testing. It acknowledged the correction with '*Mersi pour klarifikasyon*' ('Thanks for the clarification') and used the correct wording thereafter. This interaction is illustrated by the relevant screenshot in Figure 1.

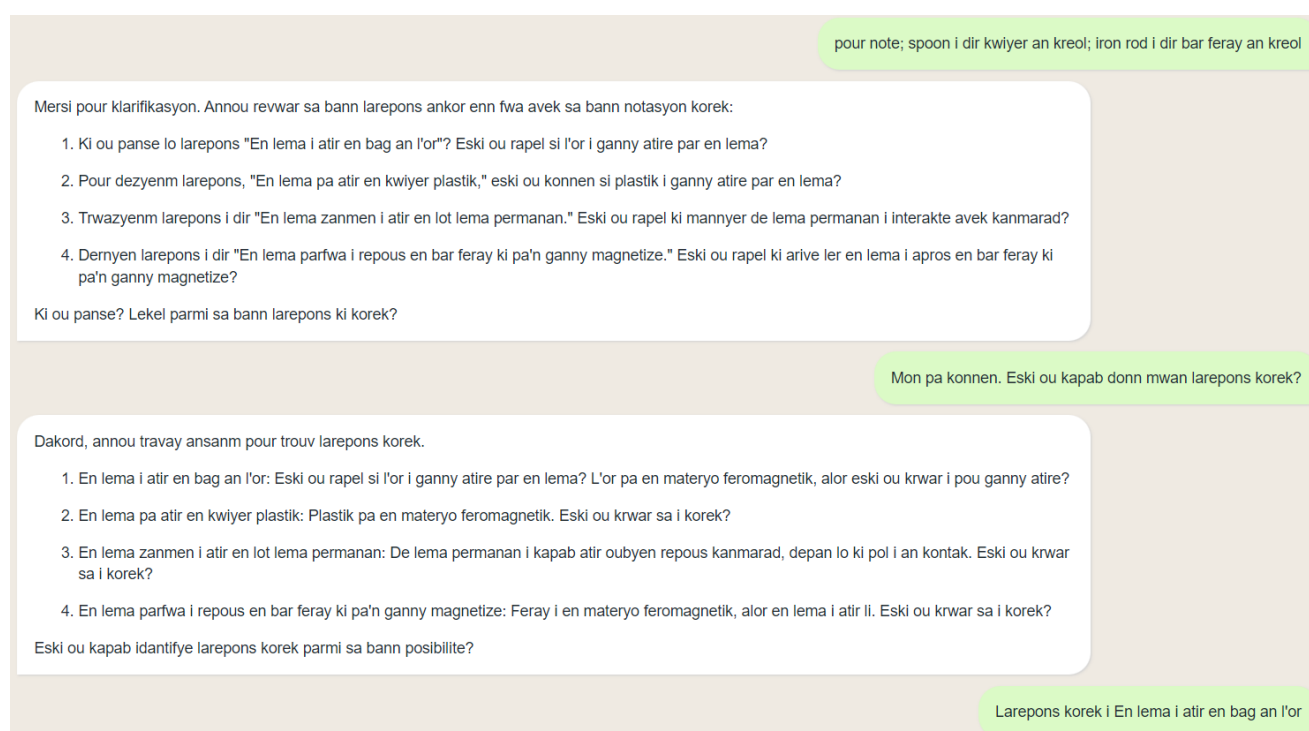


Figure 1: Correcting translation errors

There were instances of literal translation that could be deemed as (relatively) felicitous in English but not in Creole:

- (1) *Bann molekil i lib pour deplase pase kanmarad* 'Molecules are free to displace past each other'.

In Creole, (1) should ideally read: *Bann molekil i lib pou pas otour e depas kanmarad*.

- (2) *Mon eskiz mwan, ou byen kler* 'Excuse me, you are very clear'.

Kler connotes not just the word 'clear' but also 'light-coloured' which is semantically incompatible with the essence of the sentence. The Kreol Seselwa clause should read: *ou'n fer byen kler* 'You have made it very clear'.

There was limited interference from other French Creoles, except for one example:

- (3) *Wi ou lo bon sime* > 'Yes you are on the good road' (lit.) / Yes, you are on the right track.

Sime means road in Mauritian Creole while it is *semen* in Kreol Seselwa. The different forms of the same lexifier word *chemin* (allomorphic variation) reflect independent changes to the phonological system and sociolinguistic context of each Creole.

Author 1 made use of Chatspeak in order to elucidate the chatbot's comprehension abilities. These terms appeared to be clearly understood by the chatbot, as evidenced in (4) and (5). Notably, the AI chatbot did not reciprocate this vernacular style.

- (4) *Mn p konpran pole* – *Mon pa konpran pole* (suppletion of 2 vowels)

- (5) *Ok la mn kprn* – *Ok la mon konpran* (suppletion of 3 vowels and 1 consonant)

It is noteworthy that the Creole-English code-switched language was perfectly understood by the chatbot, even if it did not make use of it.

5.2 Science communication results

This section outlines observations on the use of Kreol Seselwa in education, incorporating perspectives from the educator and the four secondary students. Initially, a multiple-choice question was entered into the AI tutor, which translated it into Kreol Seselwa. Instead of providing a direct answer, the tutor posed guiding questions facilitating problem-solving, as shown in Figure 2.

Lekel parmi sa bann larepons ki korek konseman lema?

a. A magnet attracts a golden ring. b. A magnet does not attract a plastics spoon. c. A magnet never attracts another permanent magnet. d. A magnet sometimes repels an unmagnetised iron rod.

Ok, annou analiz sak larepons enn par enn.

1. Ki oupanse lo sa premye larepons, "A magnet attracts a golden ring"? Eski ou rapel si l'or i atire par en magnet?
2. Pour sa dezyenm larepons, "A magnet does not attract a plastics spoon," eski ou konnen si plastik i ganny atire par magnet?
3. Trwazyenm larepons i dir "A magnet never attracts another permanent magnet." Eski ou rapel ki mannyer de magnet i interakte avek kanmarad?
4. Deryen larepons i dir "A magnet sometimes repels an unmagnetised iron rod." Eski ou rapel ki arive ler en magnet i apros en rod fer ki pa'n ganny magnetize?

Ki ou pansé? Lekel parmi sa bann larepons ki korek?

magnet i dir lema an kreol

Ah, mersi pour sa klarifikasyon. Annou revwar sa bann larepons an term lema.

1. Ki ou pansé lo larepons "En lema i atir en bag an l'or"? Eski ou rapel si l'or i ganny atire par en lema?
2. Pour dezyenm larepons, "En lema pa atir en kuyer plastik," eski ou konnen si plastik i ganny atire par en lema?
3. Trwazyenm larepons i dir "En lema zanmen i atir en lot lema permanan." Eski ou rapel ki mannyer de lema permanan i interakte avek kanmarad?
4. Deryen larepons i dir "En lema parfwa i repous en rod fer ki pa'n ganny magnetize." Eski ou rapel ki arive ler en lema i apros en rod fer ki pa'n ganny magnetize?

Ki ou pansé? Lekel parmi sa bann larepons ki korek?

Figure 2: Translating the question into Kreol Seselwa

The AI's translation demonstrated notable clarity, though as discussed above, certain terms required correction by inputting precise Kreol Seselwa equivalents, as illustrated in Figures 3 and 4.

Lekel parmi sa bann larepons ki korek konsernan lema?

a. A magnet attracts a golden ring. b. A magnet does not attract a plastics spoon. c. A magnet never attracts another permanent magnet. d. A magnet sometimes repels an unmagnetised iron rod.

Ok, annou analiz sak larepons enn par enn.

1. Ki ou panse lo sa premye larepons, "A magnet attracts a golden ring"? Eski ou rapel si l'or i atire par en magnet?
2. Pour sa dezyenm larepons, "A magnet does not attract a plastics spoon," eski ou konnen si plastik i ganny atire par magnet?
3. Trwazyenm larepons i dir "A magnet never attracts another permanent magnet." Eski ou rapel ki mannyer de magnet i interakte avek kanmarad?
4. Dernyen larepons i dir "A magnet sometimes repels an unmagnetised iron rod." Eski ou rapel ki arive ler en magnet i apros en rod fer ki pa'n ganny magnetize?

Ki ou panse? Lekel parmi sa bann larepons ki korek?

magnet i dir lema an kreol

Ah, mersi pour sa klarifikasyon. Annou revwar sa bann larepons an term lema.

1. Ki ou panse lo larepons "En lema i atir en bag an l'or"? Eski ou rapel si l'or i ganny atire par en lema?
2. Pour dezyenm larepons, "En lema pa atir en kuyer plastik," eski ou konnen si plastik i ganny atire par en lema?
3. Trwazyenm larepons i dir "En lema zanmen i atir en lot lema permanan." Eski ou rapel ki mannyer de lema permanan i interakte avek kanmarad?
4. Dernyen larepons i dir "En lema parfwa i repous en rod fer ki pa'n ganny magnetize." Eski ou rapel ki arive ler en lema i apros en rod fer ki pa'n ganny magnetize?

Ki ou panse? Lekel parmi sa bann larepons ki korek?

Figure 3: Translating 'magnet' to Kreol Seselwa as 'lema'

pour note; spoon i dir kwiyer an kreol; iron rod i dir bar feray an kreol

Mersi pour klarifikasyon. Annou revwar sa bann larepons ankor enn fwa avek sa bann notasyon korek:

1. Ki ou panse lo larepons "En lema i atir en bag an l'or"? Eski ou rapel si l'or i ganny atire par en lema?
2. Pour dezyenm larepons, "En lema pa atir en kwiyer plastik," eski ou konnen si plastik i ganny atire par en lema?
3. Trwazyenm larepons i dir "En lema zanmen i atir en lot lema permanan." Eski ou rapel ki mannyer de lema permanan i interakte avek kanmarad?
4. Dernyen larepons i dir "En lema parfwa i repous en bar feray ki pa'n ganny magnetize." Eski ou rapel ki arive ler en lema i apros en bar feray ki pa'n ganny magnetize?

Ki ou panse? Lekel parmi sa bann larepons ki korek?

Mon pa konnen. Eski ou kapab donn mwan larepons korek?

Dakord, annou travay ansanm pour trouv larepons korek.

1. En lema i atir en bag an l'or: Eski ou rapel si l'or i ganny atire par en lema? L'or pa en materyo feromagnetik, alor eski ou krwar i pou ganny atire?
2. En lema pa atir en kwiyer plastik: Plastik pa en materyo feromagnetik. Eski ou krwar sa i korek?
3. En lema zanmen i atir en lot lema permanan: De lema permanan i kapab atir oubyen repous kanmarad, depan lo ki pol i an kontak. Eski ou krwar sa i korek?
4. En lema parfwa i repous en bar feray ki pa'n ganny magnetize: Feray i en materyo feromagnetik, alor en lema i atir li. Eski ou krwar sa i korek?

Eski ou kapab idantifye larepons korek parmi sa bann posibiliite?

Larepons korek i En lema i atir en bag an l'or

Figure 4: Translating 'spoon' and 'metal rod' to Kreol Seselwa as 'kwiyer' and 'bar feray'

Rather than directly addressing incorrect answers, the AI tutor encouraged reflective analysis. For instance, in Figure 5, the interaction ‘*Mon pa konnen. Eski ou kapab donn mwan larepons korek?*’ (‘I don’t know. Can you give me the correct answer?’) prompted guided feedback.

pour note; spoon i dir kwiyer an kreol; iron rod i dir bar feray an kreol

Mersi pour klarifikasyon. Annou revwar sa bann larepons ankor enn fwa avek sa bann notasyon korek:

1. Ki ou panse lo larepons "En lema i atir en bag an l'or"? Eski ou rapel si l'or i ganny atire par en lema?
2. Pour dezyenm larepons, "En lema pa atir en kwiyer plastik," eski ou konnen si plastik i ganny atire par en lema?
3. Trwazyenm larepons i dir "En lema zanmen i atir en lot lema permanan." Eski ou rapel ki mannyer de lema permanan i interakte avek kanmarad?
4. Dernyen larepons i dir "En lema parfwa i repous en bar feray ki pa'n ganny magnetize." Eski ou rapel ki arive ler en lema i apros en bar feray ki pa'n ganny magnetize?

Ki ou panse? Lekel parmi sa bann larepons ki korek?

Mon pa konnen. Eski ou kapab donn mwan larepons korek?

Dakord, annou travay ansanm pour trouv larepons korek.

1. En lema i atir en bag an l'or: Eski ou rapel si l'or i ganny atire par en lema? L'or pa en materyo feromagnetik, alor eski ou krwar i pou ganny atire?
2. En lema pa atir en kwiyer plastik: Plastik pa en materyo feromagnetik. Eski ou krwar sa i korek?
3. En lema zanmen i atir en lot lema permanan: De lema permanan i kapab atir oubyen repous kanmarad, depan lo ki pol i an kontak. Eski ou krwar sa i korek?
4. En lema parfwa i repous en bar feray ki pa'n ganny magnetize: Feray i en materyo feromagnetik, alor en lema i atir li. Eski ou krwar sa i korek?

Eski ou kapab idantifye larepons korek parmi sa bann posibilite?

Larepons korek i En lema i atir en bag an l'or

Figure 5: Educator prompting the AI tutor for the correct answer

With the incorrect response provided, as shown in Figure 6, the AI tutor replied ‘*Annou analiz sa larepons ankor*’ (‘Let us analyse the answer again’), inviting critical thinking.

Larepons korek i En lema i atir en bag an l'or

Annou analiz sa larepons ankor:

"En lema i atir en bag an l'or."

Eski ou rapel ki kalite materyo en lema i atir? Eski l'or i en materyo feromagnetik, parey fer, nikl oubyen kobalt?

Si ou rapel byen, l'or pa ganny atire par en lema aköz i pa en materyo feromagnetik. Alor, eski ou krwar sa larepons i korek?

Eski ou ti a kontan revwar lezot larepons ankor enn fwa oubyen ou annan en lot larepons an tet?

Larepons korek i En lema pa atir en kwiyer plastik

Tre byen! "En lema pa atir en kwiyer plastik" i korek. Plastik pa en materyo feromagnetik, alor i pa ganny atire par en lema.

Ki mannyer ou santi konsernan bann lezot larepons? Eski nou bezwen diskite zot ankor?

Figure 6: Encouraging the educator to reconsider the given answer

Upon giving the correct answer, as shown in Figure 7, the AI tutor congratulated the educator, ‘*Tre byen*’ (‘Very good’).

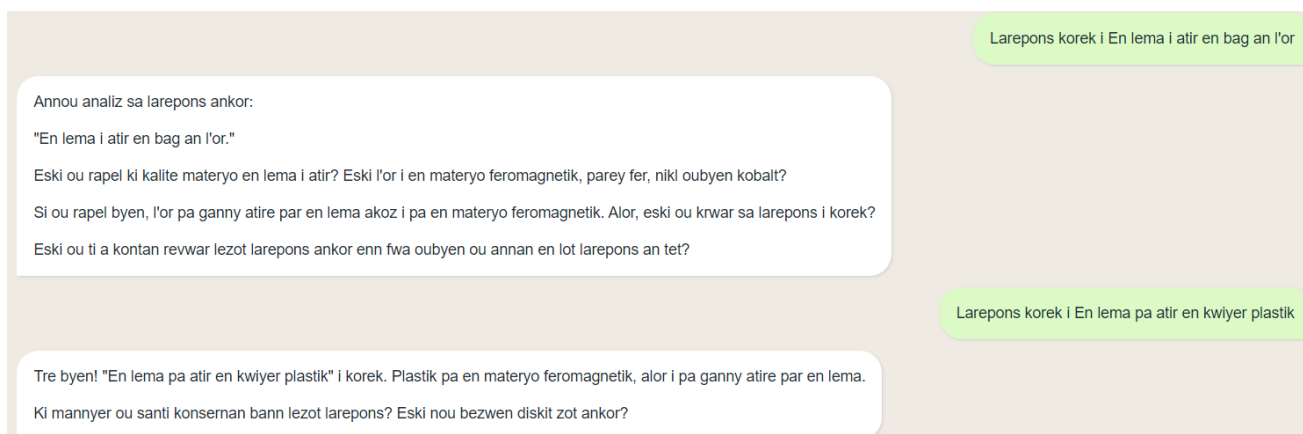


Figure 7 Correct answer given and acknowledgement by the AI tutor

The educator highlighted the AI tutor's ability to present clear and relatable explanations, often using familiar examples to reinforce understanding. Similarly, students noted the AI tutor's incremental approach to building knowledge.

In Figure 8, when Secondary 1 students asked '*Kisisa crystallisation?*' ("What is crystallization?"), the AI tutor responded with foundational questions, such as '*Bon keस्थ्यon. Ok, annou komans avek en baz senp. Eski ou kapab esplike mwan ki ou konpran par en solid ek en likid? Ki diferans prensipal ant zot?*' ("Good question. OK, let's start with the basics. Can you explain what you understand by a solid and a liquid? What is the main difference between them?").



Figure 8: Guiding the students to understand the basics first

The interactions that followed were led by guided discovery, where the AI tutor continued to steer the students toward the answer without directly providing it, as seen in Figure 9.

kisisa crystallisation?

Bon kestyoni! Ok, annou komans avek en baz senp. Eski ou kapab eksplike mwan ki ou konpran par en solid ek en likid? Ki diferans prensipal ant zot?

Solid i annan en fixed shape and a fixed volume. Liquid napa fixed shape selman i annan volume.

Tre byen! Alor, ou'n mansyonn ki solid i annan en form fix. Eski ou'n deza vwar bann kristal, parey bann kristal sel oubyen sik? Ki ou panse i fer sa bann kristal annan en form spesifik?

sel i ekrir disel an kreol e sik i ekrir disik an kreol

Mersi pour sa klarifikasyon! Alor, ou'n deza vwar bann kristal disel oubyen disik. Ki ou panse i fer sa bann kristal annan en form spesifik? Ki ou panse i arive pandan prosen ki apel kristalizasyon?

Mon pa konnen. dir mwan larepons silvouple

Mon konpran ou anvi konn larepons, me annou sey dekouver li ansanm. Kan ou met disel dan delo e fer li disoud, ki ou panse i arive ler sa delo i evapore? Ki ou panse i reste?

i reste disel

Egzakteman! Ler delo i evapore, disel i reste deryer. Me annou al en pe pli profon. Ki ou panse i arive avek bann molekil disel pandan ki delo pe evapore? Eski zot reste dezordonnen oubyen zot organiz zot dan en fason spesifik?

Figure 9: Guided discovery by the AI tutor

When the explanations became more challenging, the students informed the tutor that they had not yet covered those concepts and asked for a simpler explanation: '*nou pankor konmans aprann sa bann zafer, alor dan en term senp kisavedir kristalizasyon?*' ('We have not yet learnt these things, so in simple terms what is crystallization?').

zot organiz zot dan en fason spesifik

Egzakteman! Bann molekil disel i aranz zot dan en fason spesifik pour form bann kristal. Ki ou krwar i fer sa bann molekil aranz zot dan en fason spesifik? Ki kalite lafors oubyen lyezon i kapab egziste ant bann molekil?

mon pa konnen

Pa problem! Annou mazin lo la ansanm. Kan ou annan de magnet, ki ou vwar arive ler ou apros zot ansanm? Ki kalite lafors ou panse i egziste ant sa bann magnet?

sa bann molekil pe atrakte ansanm

Egzakteman! Bann molekil disel i atrakte ansanm atraver bann lafors elektostatik. An kor, bann ions pozitif (sodium, Na+) e bann ions negatif (chloride, Cl-) i atir kanmarad pour form en latraksion for. Ki ou panse i arive ler sa bann ions i ganny aranze dan en fason spesifik pandan kristalizasyon? Ki form sa bann kristal i pran?

zot pran en laform solid

Egzakteman, zot pran en laform solid. Me annou al en pe pli profon. Kan bann ions sodium (Na+) ek chloride (Cl-) i aranze ansanm, zot form en lastrikti ki nou apel en "lattice kristalin". Ki ou panse i fer sa lastrikti solid e stab? Ki kalite lyezon i egziste ant bann ions dan sa lattice?

nou pankor konmans aprann sa bann zafer. alor dan en term senp kisavedir kristalizasyon.

Figure 10: Students informing the AI tutor of their level

The AI tutor adapted, as observed in Figure 11, ‘*Bon kestyon. Annou esplike li dan en fason pli senp...*’ (‘Good question. Let’s explain it in a simpler way...’).

Bon kestyon! Annou eksplike li dan en fason pli senp. Kristalizasyon i en prosesis kot bann molekil oubyen ions i vin organize dan en fason regilye e repetitiv pour form bann kristal. I parey en legzanp kot ou aranz bann lego an fason byen organize pour kree en striktir spesifik. Eski sa i fer sans pour ou?

Figure 11: Adjusting the explanation to the students’ level

In other instances, the AI tutor provided additional details without being prompted to do so, enhancing clarity. For instance, in response to ‘*kwa sa akselerasyon?*’ (‘What is acceleration?’) the tutor added ‘*me annou al plis an detay*’ (‘But let us go into more detail’), as seen in Figure 12.

bonzour. Mon en etidyan dan Secondary Four e mon pare pour konmans rod lesplikasyon pour mon devwar Physics

Bonzour! Mon kontan ou pare pour travay lo ou devwar. Ki problemn fizik ou pe travay lo la? Eski ou kapab partaz en pe plis detay pour nou konmans travay lo la ansanm?

Kwa sa akselerasyon?

Bon kestyon! Annou konmans avek en definisyon senp. Akselerasyon i en mezir ki montre konbyen vitess en obze i sanze avek letan. I kapab en sanzman dan vitess (ki vedir obze pe al pli vit oubyen pli dousman) oubyen en sanzman dan direksyon.

Me annou al plis an detaye. Si en loto i pe akseler, ki ou panse i pe arive avek son vitess? Eski i pe ogmante, diminye, oubyen sanze direksyon?

son vitess pe ogmante

Egzakteman! Ler en loto pe akseler, son vitess pe ogmante. Me akselerasyon i kapab osi vedir en sanzman dan vitess kan loto i ralanti oubyen sanze direksyon.

Eski ou konnen ki fomil nou servi pour kalkil akselerasyon? Ki bann varyab ou krwar i enportan pour konn akselerasyon en obze?

kantite letan, zistans, direksyon

Figure 12: Expanding on the explanation of acceleration

While discussing acceleration, the students requested an example using numbers, and the AI tutor responded with one, as seen in Figure 13 ‘*Eski ou kapab donn mwan en legzanp avek bann limero*’ (‘Can you me an example using numbers’).

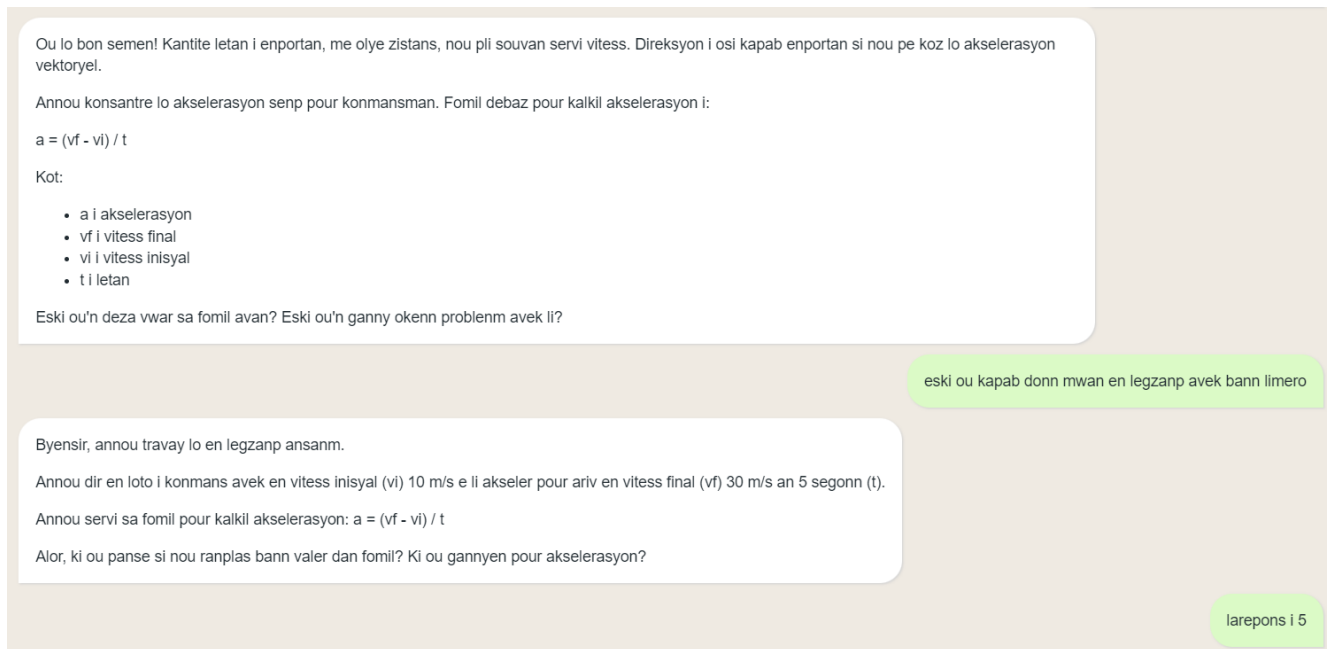


Figure 13: AI tutor providing an example

However, as shown in Figure 14, the AI tutor was unable to generate diagrams. Nonetheless, it successfully guided the students on how to create one. For example, when a student asked, ‘*Eski ou kapab design enn pour mwan?*’ (‘Can you draw one for me?’), the AI tutor replied: ‘*Malerezman, mon pa kapab desin direkteman dan sa konversasyon. Me mon kapab gid ou pour fer en desen ou menm*’. (‘Unfortunately, I cannot draw diagrams directly in this conversation. But I can guide you in drawing one yourself’.)

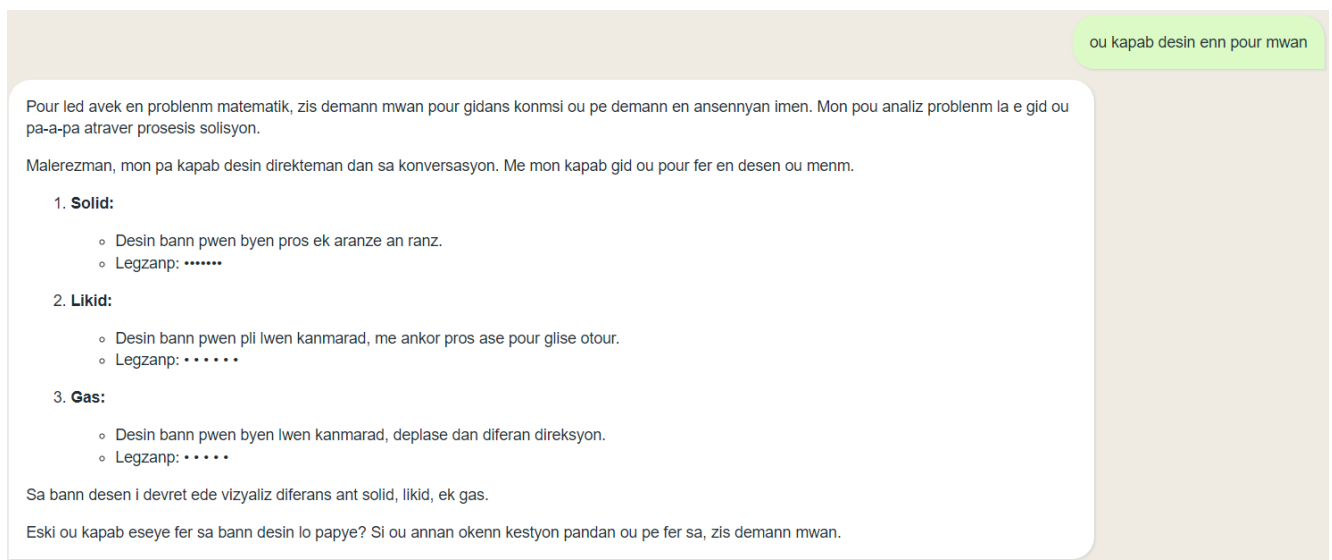


Figure 14: Guiding students on how to draw a diagram

Overall, the AI tutor demonstrated high comprehension and near-perfect accuracy in Kreol Seselwa. It was very responsive, offering personalized responses, a friendly and courteous tone. The overall agreeability was also enhanced by a display of

acknowledgement of error and wish to correct itself. It promoted discovery-based learning, guiding students to answers rather than providing them outright.

5.4 Participant discussion feedback summary

The discussion feedback is outlined in 5.4.1, 5.4.2 and summarized in Table 1.

5.4.1 Educator

The educator expressed initial surprise at the AI tutor's effectiveness in explaining science and physics concepts, praising its ability to guide students toward answers and encourage reflection. He welcomed the way the AI chatbot's explanations developed incrementally, employing knowledge scaffolding to support understanding. Nonetheless, regarding translation accuracy, he observed that while some terms were accurate, others required revising, often due to literal translations or grammatical misalignments. For instance, direct translations sometimes altered the intended meaning, but once corrected (for example, '*lema*' for 'magnet'), the AI chatbot consistently used the correct terminology. Furthermore, concise instructions and progressive complexity make the AI tutor accessible, particularly for students struggling with English. The educator suggested the AI tutor could complement existing teaching methods by enhancing comprehension, supporting independent practice, and even assisting parents in engaging with their children's learning. He applauded the tool's constant ability to improve accuracy as it integrates more Kreol Seselwa language data.

5.4.2 Students

The students found the AI tutor to be helpful particularly for those who struggle with English or technical terms. They appreciated the chatbot's ability to provide step-by-step guidance and simplify complex concepts, making science and physics more accessible. While some content exceeded their current grade level, students noted that the scaffolding improved understanding. The AI's translations were considered largely accurate, with participants estimating precision levels between 91% and 99.9%. Minor errors were usually decipherable, and explanations in Kreol often clarified otherwise challenging English terms. They expressed a preference for a mix of Kreol and English in tutoring, as some concepts were easier to understand in one language over the other. Limited studies undertaken to date on AI chatbots (Bender et al., 2021; Fakour and Imani, 2025; Serban et al., 2020) show that many students prefer ChatGPT as a learning tool. They value its non-judgmental nature, accessibility and ability to promote self-directed exploration, which creates a low-stress and empowering environment. The students did not discount the role of human tutors who they particularly appreciated for their capability to provide tailored feedback and emotional support. They appreciated how it simplified science concepts and supported ongoing interaction until mastery, making it a valuable tool, particularly for those with well-developed digital literacy skills.

Table 1: Responses to group interview Questions

Questions	Educator	S1 Students	S4 Students
Initial thoughts on AI tutor's effectiveness in explaining science/physics concepts	<ul style="list-style-type: none"> ◆ Beyond expectations ◆ Surprised by the vocabulary ◆ Generates questions when unsure ◆ Guides the learner to find the answer ◆ Allows further reflections ◆ Imparts knowledge incrementally 	<ul style="list-style-type: none"> ◆ Good although occasional errors ◆ Particularly good for kids who are not very fluent in English ◆ For kids who do not know complex English words 	Can guide step by step, brought clarity, provided guided explanations along the process, knowledge to do better. Can help less able learners.
Accuracy in translating science/physics terminology and concepts into Kreol	Yes and no. Some terms not adequate translation, literal, misalignment of grammatical structure, translations etc.	Participant 1-S1 gave 91% Participant 2-S1 gave 95%	Participant 1-S4 gave 96% Participant 2-S4 gave 99.9%
Clear instructions/ explanations?	<ul style="list-style-type: none"> ◆ Particularly good for learners struggling with English ◆ Useful for interactions involving code-switching 	<ul style="list-style-type: none"> ◆ Do not understand some parts ◆ Not on grade level but got the chatbot to adjust the level 	A few minor errors but can figure out meaning.
Do you prefer getting science/physics tutoring help in Kreol or English, and why?	<i>N/A - For students only</i>	<ul style="list-style-type: none"> ◆ Depends on the topic and context ◆ Both languages would be helpful 	<ul style="list-style-type: none"> ◆ Both. Good to have an app in SC for a better understanding ◆ 100% prefer this type of app instead of one in English only
Does the AI tutor make learning science/physics more engaging for you?	<i>N/A - For students only</i>	<ul style="list-style-type: none"> ◆ Makes Science easier ◆ Would like to have the tutoring help with homework 	<ul style="list-style-type: none"> ◆ Worth using ◆ Learners are more technology-oriented ◆ Having an app that could help would help for the better

6. Conclusion and recommendations

This study has demonstrated the potential of the AI Tutor as a transformative educational tool for secondary science education in Seychelles. By operating in Kreol Seselwa and

employing guided discovery methods, the AI tutor enhances accessibility, inclusivity, independent learning and critical thinking. Its adaptability to varying proficiency levels and its ability to simplify complex concepts make it particularly effective in addressing diverse student needs.

In response to RQ1 (Effectiveness of AI tutor in communicating science concepts in Kreol Seselwa), the findings indicate that the AI Tutor effectively conveyed science concepts in Kreol Seselwa, offering clear explanations and enhancing engagement through interactive questioning. However, minor translation inconsistencies and the chatbot's inability to generate diagrams were noted as areas requiring further refinement.

Regarding RQ2 (Language challenges in using an AI Tutor in Kreol Seselwa for science education), while the AI Tutor demonstrated high comprehension and near-perfect accuracy in Kreol Seselwa, some translation errors required correction. The chatbot successfully adapted to these corrections, suggesting its potential for ongoing refinement. Code-switching between Kreol Seselwa and English also emerged as a beneficial strategy for facilitating comprehension.

In relation to RQ3 (Impact of AI Tutor's use of Kreol Seselwa on student engagement), the AI Tutor was well received by students and the educator, who valued its ability to simplify concepts, encourage self-directed learning, and sustain engagement. Its interactive approach fostered critical thinking and provided a supportive learning environment. The students' preference for a bilingual tutoring experience highlights the importance of maintaining flexibility in language use within AI-driven educational tools. The educator emphasized the AI Tutor's role in complementing classroom instruction and supporting parental involvement, particularly for families less confident in English or scientific subjects. Its capacity to facilitate code-switching between Kreol Seselwa and English further supports bilingual students, aligning with Seychelles' multilingual education system.

Despite its strengths, the AI Tutor has some limitations. The lack of diagram-generation capabilities was a key drawback and refining its technical terminology would enhance usability. Additionally, training for both students and educators on the ethical and effective use of ChatGPT is crucial as the technology becomes more integrated into learning environments. This training would ensure responsible usage, prevent misuse and maximize its potential as a learning tool. As Chan and Hu (2023) discovered, while students recognize the advantages of generative AI in higher education, they also stress the importance of AI literacy to effectively manage its limitations.

Moving forward, it is recommended that this tool be rolled out beyond a single subject in Seychelles, and to pioneer a model for AI-driven, linguistically-inclusive education that could inspire similar innovations across the Global South and beyond. This is particularly significant in postcolonial and multilingual contexts such as Seychelles, where language

hierarchies persist in educational settings. By empowering students to have recourse to their L1, the AI Tutor aligns with the realities of multilingual learning and reflects a pedagogy rooted in local knowledge and linguistic identity. The implications of these findings extend beyond the immediate research questions or the local context. In a world where digital tools increasingly shape educational access and quality, this study underscores the urgent necessity of integrating AI into educational systems, especially for small, under-resourced and linguistically diverse communities.

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