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RESEARCH ARTICLE

Intention to use an interactive Artificial Intelligence (AI) chatbot for learning self-medication consultation among pharmacy students

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Abstract

Background: Whilst Artificial Intelligence (AI) holds great potential as a significant component in pharmacy education, research on students' intentions as the relevant key stakeholders is lacking. This study describes Indonesian pharmacy students' intention to use a newly developed AI chatbot for Self-Medication Consultation Learning (SMCL-chatbot), and the determinant factors. **Methods:** A questionnaire adapted from the Unified Theory of Acceptance and Use of Technology (UTAUT2) model was used to assess the students' intentions. A tryout for SMCL-chatbot was conducted among pharmacy students at the University of Surabaya's 2024 "Responding to Symptom" classes (n = 237). After interacting with the SMCL-chatbot, the students filled out the questionnaire. **Results:** Of the 237 students, 201 participated from which 90% expressed a positive intention to use the SMCL-chatbot. More than 80% had positive perceptions of the UTAUT2 constructs, including: performance expectancy, effort expectancy, facilitating condition, and hedonistic motivation. Performance expectancy (OR: 16.5, 95% CI: 1.42-192.42, p: 0.025) and hedonistic motivation (OR: 19.4, 95%CI: 2.60-144.63, p: 0.004) were significantly related to students' intentions. **Conclusion:** Students showed positive intentions to use the SMCL-chatbot, indicating their readiness to adopt the technology for learning self-medication consultations. Further research is required to demonstrate the effectiveness of improving students' consultation skills and to perform a cost-benefit analysis.

Introduction

Self-medication is defined as *"the use of nonprescription medicines by people on their own initiative"* (International Pharmaceutical Federation and World Self Medication Industry, 1999). The practice of self-medication can vary significantly across different regions and countries. The prevalence of self-medication worldwide was 67% and the mean incidence rate was higher in Eastern Europe and Asian countries compared to other parts of the world (Ghasemyani *et al.,* 2022). In particular, self-medication is prevalent in Indonesia, with data in 2022 showing that 75% of Indonesians practised self-medication (Badan Pusat Statistik, 2023). While self-medication is occasionally appropriate for minor ailments or temporary relief, it can also pose risks, including misdiagnosis, incorrect dosing, adverse reactions, and masking underlying health issues that require professional attention (World Health Organisation, 2000).

Community pharmacies are a common source of people who want to self-medicate (Ghasemyani *et al.,* 2022; Petrovi´c *et al.,* 2022). This highlights the importance of community pharmacists in providing quality self-medication consultations. However, studies in community pharmacies revealed sub-par self-medication consultations including inadequate patient assessment, inappropriate recommendations, and sub-optimal patient counselling (Alastalo *et al.,* 2023; Brata *et al.,* 2019; Loh *et al.,* 2023; Roseno & Widyastiwi, 2023). In developing countries, one of the factors contributing to the sub-optimal self-medication consultations in community pharmacies is a lack of skills and knowledge. This lack of skills and knowledge may originate from the sub-optimal quality of pharmacy education. A lack of relevance between the curriculum and practical needs, as well as the commercialisation of educational institutions prioritising quantity over quality, were proposed as problems faced by pharmacy educators in developing countries (Brata *et al.,* 2016; Mizranita *et al.,* 2023; Thang, 2013).

The foundation for providing quality self-medication consultations begins during pharmacy education. Many countries in the Global South have now adopted a six-year pharmacy curriculum to provide greater clinical training opportunities. However, pharmacy education in Indonesia still follows a five-year curriculum to become a pharmacist, with no current information suggesting that Indonesia will shift to a six-year program. Under the current model, pharmacy education consists of a four-year bachelor's degree (BPharm) followed by a one-year pre-registration training programme (Apothecary programme). The curriculum in the BPharm programme emphasises fundamental sciences, whereas the Apothecary programme emphasises applied practice. Pharmacy students are required to be competent in their ability to provide quality self-medication consultations (Asosiasi Pendidikan Tinggi Farmasi Indonesia, 2013). However, several studies on Indonesian pharmacy students indicate the need for further improvement. Using the simulated patient method, only 56% of the 183 third-year pharmacy students provided appropriate recommendations in the case of a cough due to asthma (Brata *et al.,* 2021). Similarly, another research conducted on Indonesian apothecary students also showed that only 68% and 51% of 91 students provided appropriate recommendations in the case of cough due to asthma and acute diarrhoea in children, respectively (Indriani, 2023). In both studies, the authors stated that the information-gathering taken by students was not comprehensive.

In 2023, the Indonesian Ministry of Health issued the Indonesian Pharmacist Professional Standard to enhance the competence of Indonesian pharmacists (Kementrian Kesehatan Republik Indonesia, 2023). Aimed at improving the competence in providing self-medication consultations, this standard sets expectations for recent pharmacist graduates, emphasising essential skills such as information-gathering, analysis for medical referral needs, and providing appropriate recommendations during the consultation (Kementrian Kesehatan Republik Indonesia, 2023). Following this, stakeholders in Indonesian pharmacy education, including the Association of Indonesian Pharmacy Higher Education, the Indonesian Pharmacists Association, and the National Pharmacy Committee, have implemented an Objective Structured Clinical Examination (OSCE) for all Indonesian apothecary students before their graduation (Musfiroh *et al.,* 2021). The OSCE serves as a comprehensive assessment tool that evaluates students' practical skills, competency, and readiness for practice in a standardised and objective manner. It is a mandatory exit examination for all Indonesian pharmacist candidates and includes a component dedicated to the provision of self-medication consultations (Musfiroh *et al.,* 2021). Therefore, pharmacy academics need to ensure that their students receive adequate training to excel in the examination

Several approaches for teaching the provision of self-medication consultations for pharmacy students have been stated in the literature, such as traditional approaches (e.g., lectures, seminars, and tutorials) and active learning methods/ non-traditional approaches (e.g., problem-based learning, team-based learning, case-based learning, simulations/role play, etc) (Hastings *et al.,* 2010; Sinopoulou & Rutter, 2019). Among all these methods, an approach mimicking the OSCE, where a standardised patient is used, and feedback is provided to students, might be best for students' training. Incorporating a standardised patient approach into a self-medication consultation course has improved students' skills in counselling non-prescription medicines for self-medication, self-confidence, and self-perceived proficiency (Farahani *et al.,* 2021; Hastings *et al.,* 2010). However, the standardised patient method is resource intensive. It is time-consuming and costly, particularly for low resource settings which usually have poor funding, poor infrastructures, and inadequate academic capacities (e.g., high student-lecturer ratio) (Brata *et al.,* 2021; International Pharmaceutical Federation, 2020).

In light of this, Artificial Intelligence Chatbot (AI Chatbot) presents itself as a particularly appealing alternative (Elanjeran *et al.,* 2024). AI Chatbot is a computer program designed to simulate conversation with human users, typically through text-based interactions (Adamopoulou *et al.,* 2023). These chatbots use artificial intelligence algorithms, such as natural language processing (NLP) and machine learning, to understand and respond to user inputs in a conversational manner (Chakraborty *et al.,* 2023). Several studies have shown that AI chatbot can act as a simulated patient and facilitate interactive learning situations among healthcare students in practising with clinical case scenarios (Holderried *et al.,* 2024a; Zidoun & Mardi, 2024). AI chatbot-facilitated simulation in healthcare education can enhance accessibility and flexibility, allowing learners to engage anytime and anywhere (Makhlouf *et al.,* 2024; Zidoun & Mardi, 2024). Additionally, they offer a personalised learning experience and provide a safer environment for practising clinical skills, as opposed to the real-life ramifications when dealing with real patients (Labrague & Sabei, 2025; Srinivasan *et al.,* 2024). Furthermore, AI chatbots can deliver instant, personalised, automated feedback, enabling students to learn and improve based on this timely input (Holderried *et al.,* 2024b; Labrague & Sabei, 2025).

In 2024, an interactive AI chatbot for Self-Medication Consultation Learning (the SMCL-chatbot) was developed at the University of Surabaya. A key feature of this SMCL chatbot is its ability to simulate patient-pharmacist interactions through text-based conversations, mimicking WhatsApp Chat (Appendix A). It provides a conversation record, allowing students to reflect on their performance and their learning experience. In this context, the SMCL chatbot offers several benefits, including enhanced accessibility and flexibility, a more consistent scenario presentation compared to untrained simulated patients, and the ability to train a large number of students simultaneously. However, the SMCL chatbot lacks a personalised feedback mechanism to identify correct answers for each case and analyse the strengths and weaknesses of individual student performance. As a result, feedback for students must be provided manually.

Published research related to the use of interactive AI chatbots as a training tool for simulating patients in self-medication consultations is limited (Aziz *et al.,* 2024; Mortlock & Lucas, 2024). Given that AI technology is relatively new in pharmacy education, more research is needed to explore students' intentions in embracing this new technology for their learning. Many theories related to the adoption of new technology have been stated in literature such as the Theory of Reasoned Action (TRA), the Theory of Planned Behaviour (TPB), the Theory of Diffusion of Innovation (DIT), the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT and UTAUT2). Among them, the UTAUT model was chosen because its constructs integrate elements from various models and theories, making it more comprehensive compared to other models of technology acceptance (Venkatesh et al., 2003; Venkatesh *et al.,* 2012). This study describes pharmacy students' intentions to use the newly developed interactive AI chatbot system for self-medication consultation learning (SMCL-chatbot) and identifies factors related to their intentions based on the adapted UTAUT2 model at the University of Surabaya, Indonesia.

Methods

Research context

This was a cross-sectional study conducted in a pharmacy school at the University of Surabaya, Indonesia. At this university, third-year students are taught topics related to self-medication consultation in a 14-week course titled "*Responding to Symptoms*." The course includes 100 minutes of lecture and 150 minutes of laboratory time. During lectures, students learn about various minor conditions mostly via a didactic approach. In the laboratory sessions, students practise solving self-medication cases using a clinical vignette and engage in role-playing exercises with the lecturer or with other students.

The lecturer-student ratio in the class ranges from 1:40 to 1:60, limiting individual students' opportunities to role-play with the lecturer. As a result, many role-playing scenarios are conducted among the students themselves, whilst only a few students can role-play with the lecturer. In these student-student role-plays, the lecturer typically provides a written case for students who assume the role of the patient. However, no prior training is given to the students acting as patients, and the lecturer cannot monitor each pair's role-play sessions. Consequently, if the students playing the patient role are not familiar with the scenario, they may provide incorrect information during the interaction. After the role-plays, the lecturer provided general feedback to the entire class on the cases.

The development of the SMCL-chatbot

In 2024, an interactive AI chatbot for Self-Medication Consultation Learning (the SMLC-chatbot) was developed at the University of Surabaya in collaboration with an Indonesian AI company (PT Pertiwi Technologies) (Appendix A). The AI is designed to act as a patient by requesting medications for specific symptoms and students role-play as pharmacists. Steps for the development of this SMCL-chatbot are shown in Figure 1.

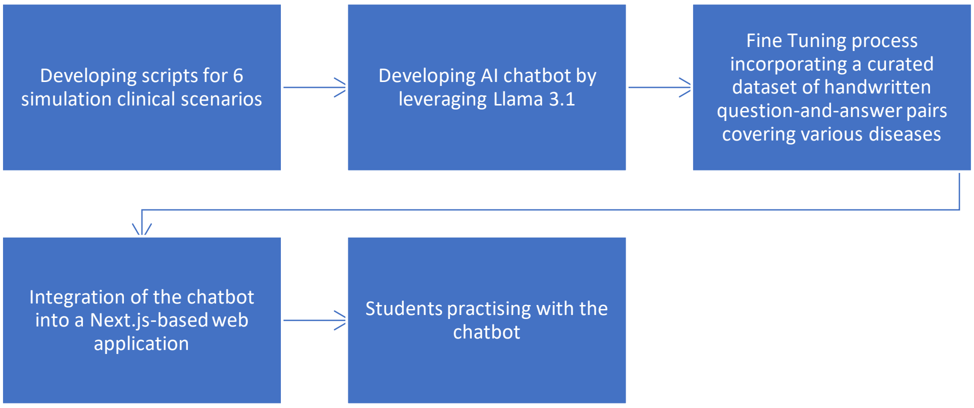

Figure 1: Steps for deeloping the self-medication consultation learning chatbot

It started with developing scripts for six cases: chronic cough due to asthma worsening, acute diarrhoea in children without alarm symptoms, dyspepsia due to the use of NSAIDs, dyspepsia with alarm symptoms, mild nausea and vomiting in pregnancy, and viral conjunctivitis. These scripts include the initial patient presentation, structured history-taking questions, and responses. The scripts were reviewed by three pharmacist academicians and two medical practitioners before being incorporated into the SMCL-chatbot.

The development of the AI chatbot used Llama 3.1, a large language model (LLM) with 8 billion parameters, as the base model, fine-tuned specifically for medical question-and-answer tasks. Llama 3.1 is an advanced natural language processing (NLP) system based on the Transformer architecture, a type of deep learning model designed to understand and generate human-like text. This architecture enables the AI to process complex language patterns, making it suitable for interactive applications such as medical training. The fine-tuning process incorporated a curated dataset of handwritten question-and-answer pairs covering various diseases, thereby enabling the AI to simulate patient interactions accurately. This enabled the model to respond in a clinically relevant manner when students inquired about symptoms, thereby serving as a virtual patient. To allow seamless integration and scalability, the model was deployed on a serverless endpoint, which efficiently handled multiple concurrent requests without requiring dedicated infrastructure. The chatbot was subsequently integrated into a Next.js-based web application, providing an interactive, user-friendly interface for students to engage in realistic medical simulations.

The students practised with the SMCL-chatbot during laboratory sessions in the class. After practising, a copy of the conversation was automatically sent to each student's email address for review and learning. The lecturer also received a copy of each student's conversation, allowing the lecturer to review each student's work (particularly knowledge and skills in information-gathering, clinical reasoning, and the provision of advice). The lecturer could also provide a mark if desired.

Research instrument

A Google Forms-based electronic questionnaire was developed to assess students' intention to use the SMCL-chatbot. This questionnaire was adapted from the Unified Theory of Acceptance and Use of Technology (UTAUT2) model (Venkatesh et al., 2003; Venkatesh *et al.,* 2012). The UTAUT2 model consists of eight key constructs, namely: performance expectancy, effort expectancy, social influence, facilitating condition, hedonistic motivation, price value, and habit, all of which are believed to be associated with the behavioural intention to use technology (Table I). Of the eight key constructs, the questions addressing price value were reformulated as open-ended items on willingness to pay, as this cohort incurred no costs for using the SMCL-chatbot during the course. Additionally, questions about habit were omitted because this was their first experience with the SMCL chatbot. Questions addressing behavioural intention to use the technology were developed using two items: (1) the student's intention to use the technology and (2) the student's intention to encourage others to adopt the technology. The latter item was included as recommending a new technology to others may signify the students' positive advocacy for the technology. A 5-point Likert scale was used to measure students' opinions on the items in the questionnaire. Details of the questionnaire items are presented in Table I.

Table I: Development of the questionnaire

Constructs from the UTAUT2 model	Definition	Questionnaire items (in Indonesian)	English translation
Performance expectancy	*"The degree to which an individual believes that using the system will help him or her to attain gains in job performance."*	1. Menggunakan chatbot AI ini membuat waktu untuk belajar konsultasi swamedikasi dalam "*praktikum MK MGP*" lebih efisien 2. Menggunakan chatbot AI ini membuat saya lebih memahami pembelajaran topik pelayanan konsultasi swamedikasi 3. Menggunakan chatbot AI ini akan meningkatkan kompetensi saya dalam memberikan pelayanan konsultasi swamedikasi	1. Using this interactive AI chatbot makes the time for learning self-medication consultations in the "*Responding to symptoms*" class more efficient 2. Using this interactive AI chatbot helps me better understand the topic of self-medication consultation services. 3. Using this interactive AI chatbot will enhance my competence in providing self-medication consultation services.
Effort expectancy	*"The degree of ease associated with the use of the system"*	4. Cara penggunaan chatbot AI ini mudah dipelajari 5. Bagi saya adalah hal yang mudah untuk menjadi mahir dalam menggunakan chatbot AI ini	4. It is easy to learn how to use this interactive AI chatbot 5. For me, it is easy to become proficient in using this interactive AI chatbot
Social influence	*"The degree to which an individual perceives that important others he or she should use the new system"*	6. Saya menggunakan chatbot AI ini karena dorongan dari dosen saya. 7. Saya menggunakan chatbot AI ini karena teman-teman saya juga menggunakan teknologi ini dalam mempelajari topik pelayanan konsultasi swamedikasi	6. I use this interactive AI chatbot because my lecturer encourages me 7. I use this interactive AI chatbot because my friends also use this technology to learn the topic of self-medication consultation services
Facilitating condition	*"The degree to which an individual believes that an organisational and technical infrastructure exists to support the use of the system"*	8. Saya memiliki fasilitas pendukung (misalnya gadget, jaringan internet) untuk mengoperasikan chatbot AI ini 9. Saya mempunyai pengetahuan yang cukup untuk bisa mengoperasikan chatbot AI ini. 10. Saya bisa mendapatkan bantuan dari orang lain (dosen atau teman) bila saya menemui kesulitan saat mengoperasikan chatbot AI ini	8. I have the necessary facilities (such as gadgets and internet access) to operate this interactive AI chatbot. 9. I have sufficient knowledge to operate this interactive AI chatbot. 10. I can get help from others (lecturers or friends) if I encounter difficulties while operating this interactive AI chatbot.
Hedonistic condition	*"The fun or pleasure derived from using a technology"*	11. Menggunakan chatbot AI ini sangat menyenangkan 12. Menggunakan chatbot AI ini membuat belajar bagaimana melakukan konsultasi pelayanan swamedikasi menjadi menarik	11. Using this interactive AI chatbot is very enjoyable. 12. Using this interactive AI chatbot makes learning how to conduct self-medication consultations interesting.
Price value	*"Consumers' cognitive tradeoff between the perceived benefits of the application and the monetary cost for using them"*	13. Jika harus berbayar, berapa harga yang pantas dibayarkan untuk dapat menggunakan chatbot AI untuk MK MGP (minimal 1 kasus tiap minggu, selama 14 minggu)?	13. If you have to pay, what would be a reasonable price to pay for using the interactice AI chatbot for this "*Responding to symptoms*" class (at least 1 case each week for 14 weeks)?
Habit	*"A perceptual construct that reflects the results of prior experience"*	Questions related to habit were omitted since this is students' initial experience using the interactive AI chatbot system – students have no prior experience in using this technology.	
Behavioural intention to use the system	*"A measure of the strength of one's intention to perform a specified behavior"*	14. Saya berniat untuk menggunakan sistem chatbot AI ini di masa mendatang untuk belajar bagaimana melakukan konsultasi pelayanan swamedikasi 15. Saya berencana untuk merekomendasikan sistem chatbot AI sebagai sarana belajar bagaimana melakukan konsultasi pelayanan swamedikasi pada teman atau adik tingkat saya	14. I intend to use this interactive AI chatbot system in the future to learn how to conduct self-medication consultations. 15. I plan to recommend the interactive AI chatbot system as a learning tool for conducting self-medication consultations to my friends or juniors.

The questionnaire was developed in the Indonesian language and assessed for content and face validity by three experts from the Medicine and Pharmacy departments. These three experts were chosen because they had experience in survey methodology, questionnaire validation, or research-related health education (Appendix B). For content validity, the experts were asked to rate the relevance and representativeness of the items for the target construct, using a scale from 1 (not relevant) to 4 (very relevant) (Yusoff, 2019). Scores of 3 and 4 were coded as 1 (relevant), and scores of 1 and 2 were coded as 0 (not relevant). The content validity index (CVI) was calculated using I-CVI (Item-level Content Validity Index), S-CVI/Ave (scale-level content validity index using averaging calculation method), and S-CVI/UA (scale-level content validity index using universal agreement calculation method), with the acceptable CVI value for three experts being one (Yusoff, 2019). The questionnaire was then piloted with 30 students, who were also part of the final sample. No significant changes to the questionnaire wording were made after the pilot; therefore, all pilot students were included in the data analysis. Cronbach's alpha was used to assess the questionnaire's reliability. A Cronbach alpha value of 0.6-0.7 indicates an acceptable level of reliability (Ursachi *et al.,* 2015).

Participant recruitment and data collection

A total sampling approach was used to obtain a representative sample. All third-year pharmacy students enrolled in the "*Responding to Symptom*" class of 2024 were eligible for recruitment (n = 237). In week eight, after engaging with the SMCL-chatbot system for six cases, students were asked to complete the questionnaire during the laboratory session. A link to the questionnaire was distributed via the class WhatsApp group. Before data collection, students were verbally informed of the study's purpose, the procedures it would involve, and that their participation was voluntary. Information and an invitation to join the research were also sent via the class WhatsApp group. An electronic participants' information sheet and consent form were included in the first section of the Google Form. Students who wished to participate were required to provide consent by clicking "*agree*" to the informed consent statement before accessing the questionnaire. Participation was voluntary, and students could opt out of completing the questionnaire. The data collected is securely stored on a password-protected laptop, ensuring that only authorised researchers involved in the study can access it. Ethics approval was obtained from the Ethical Committee of the University of Surabaya, Indonesia (No: 393/KE/VI/2024).

Data analysis

Data related to participants' demographic characteristics were analysed descriptively. Open-ended responses related to willingness to pay (i.e., price values) were categorised into price ranges, and descriptive statistical analysis—including frequency, median, mode, and minimum-maximum values—was performed and presented. Data for each construct of the adapted UTAUT2 model, collected using a 5-point Likert scale, were also analysed descriptively. Then, the percentage of students' responses for each scale was presented. Next, the item ratings within each construct of the adapted UTAUT2 model were summed to obtain a total score. For constructs derived from three items, the total score ranged from a minimum of three (if all responses are one) to a maximum of 15 (if all responses are five). For constructs derived from two items, the total score ranged from a minimum of two (if all responses are 1) to a maximum of ten (if all responses are five). After summing the scores for each construct, the total score was transformed into a binary variable. For constructs with three items, a total sum of ten or above was coded as Agree, while a total sum below ten was coded as Disagree. For a construct with two items, a total sum of seven or above was coded as Agree, while a total sum below seven was coded as Disagree. The cut points were set at ten for constructs derived from three items and seven for constructs derived from two items, as they represent the midpoint of the score range. Scores above the midpoint were considered indicative of greater agreement. In comparison, scores at or below the midpoint were considered indicative of a relatively lower level of agreement.

The data were dichotomised for subsequent univariate/multivariate analysis for several reasons. Firstly, the interpretation and communication of the results, especially the descriptive results (including the cross-tabulation data for the univariate and multivariate analysis tests), would be more straightforward when using two categories (e.g., agree vs. disagree/neutral) rather than five (strongly agree, agree, neutral, disagree, strongly disagree). Readers can easily grasp positive or negative tendencies. Secondly, dichotomising the variables was required to meet the analytical requirements for our subsequent univariate analysis (chi-square test) and multivariate analysis (binary logistic regression). One of the key assumptions of the chi-square test is that each cell in the contingency table has an expected frequency of at least 5 (Field, 2009). If this assumption is violated, researchers often combine categories or use Fisher's Exact Test for 2 × 2 tables. As shown in Table II most responses were concentrated in the "*agree*" and "*strongly agree*" categories, while the "*disagree*" and "*strongly disagree*" categories contained relatively few observations.

Table II: Descriptive results of students' views of the adapted UTAUT2 construct model

Construct	Questionnaire items	Students' perception (n = 201)					Likert scale mean (SD)
		Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)	
Performance expectancy	Using this interactive AI chatbot makes the time for learning self-medication consultations in the "Responding to symptoms" class more efficient	1 (0.5%)	2 (1%)	9 (5%)	65 (32%)	124 (62%)	4.54 (0.678)
	Using this interactive AI chatbot helps me better understand the topic of self-medication consultation services.	1 (0,5%)	1 (0,5%)	13 (7%)	70 (35%)	116 (58%)	4.49 (0.686)
	Using this interactive AI chatbot will enhance my competence in providing self-medication consultation services.	1 (0,5%)	5 (3%)	11 (6%)	79 (39%)	105 (52%)	4.40 (0.750)
Effort expectancy	It is easy to learn how to use this interactive AI chatbot	1 (0,5%)	1 (0,5%)	7 (4%)	64 (32%)	128 (64%)	4.58 (0.637)
	For me, it is easy to become proficient in using this interactive AI chatbot	0 (0%)	5 (3%)	33 (16%)	79 (39%)	84 (42%)	4.2 (0.802)
Social influence	I use this interactive AI chatbot because my lecturer encourages me	9 (5%)	19 (10%)	46 (23%)	61 (30%)	66 (33%)	3.78 (1.138)
	I use this interactive AI chatbot because my friends also use this technology to learn the topic of self-medication consultation services	3 (2%)	9 (5%)	43 (21%)	79 (39%)	67 (33%)	3.99 (0.930)
Facilitating condition	I have the necessary facilities (such as gadgets and internet access) to operate this interactive AI chatbot.	0 (0%)	1 (0,5%)	6 (3%)	61 (30%)	133 (66%)	4.62 (0.571)
	I have sufficient knowledge to operate this interactive AI chatbot.	0 (0%)	2 (1%)	22 (11%)	86 (43%)	91 (45%)	4.32 (0.707)
	I can get help from others (lecturers or friends) if I encounter difficulties while operating this interactive AI chatbot.	1 (0.5%)	3 (2%)	7 (4%)	64 (32%)	126 (63%)	4.55 (0.685)
Hedonistic motivation	Using this interactive AI chatbot is very enjoyable.	1 (0.5%)	2 (1%)	10 (5%)	60 (30%)	128 (64%)	4.55 (0.684)
	Using this interactive AI chatbot makes learning how to conduct self-medication consultations interesting	1 (0,5%)	1 (0,5%)	8 (4%)	63 (31%)	128 (64%)	4.57 (0.645)
Behavioural intention	I intend to use this interactive AI chatbot system in the future to learn how to conduct self-medication consultations.	1 (0,5%)	4 (2%)	15 (8%)	67 (33%)	114 (57%)	4.44 (0.760)
	I plan to recommend the interactive AI chatbot system as a learning tool for conducting self-medication consultations to my friends or juniors.	1 (0,5%)	1 (0,5%)	17 (9%)	71 (35%)	111 (55%)	4.44 (0.713)

To address this imbalance and satisfy the expected frequency assumption, we consolidated the five response categories into two broader categories. Further, for the multivariate analysis using binary logistic regression, this analysis requires a binary dependent variable (Field, 2009). Therefore, dichotomisation was necessary to enable this form of analysis. Lastly, our data originated from Likert-scale items, which are ordinal in nature. Although some researchers treat ordinal data as interval/continuous data, this practice remains debated (Safitri, 2024; Sullivan & Artino, 2013; Wu & Leung, 2017). The primary limitation lies in the fact that ordinal scales indicate a ranked order of categories but do not assume equal intervals between them—for example, the perceived difference between "*agree*" and "*strongly agree*" may not be equivalent to that between "*neutral*" and "*agree*" (Sullivan & Artino, 2013).

A univariate analysis using a chi-square test and a multivariate analysis using a binary logistic regression were then used to identify significant variables associated with students' behavioural intention to use the SMCL-chatbot. Independent variables were derived from (1) participants' demographic characteristics (i.e., gender, age, previous education, their experience of training or working in community pharmacies, and Grade Point Average-GPA), (2) the binary value for each construct of the adapted UTAUT2 model (i.e., Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Condition, and Hedonistic Motivation). The GPA and participants' age were dichotomised around the mean; ≤ 2.8 and > 2.8 for GPA and ≤ 20 years old and > 20 years old for participants' age. A backward elimination with a significance threshold of 0.05 was implemented to obtain the final, multivariate model. Odds ratios (OR) and 95% confidence intervals were calculated. IBM SPSS Statistics for Windows version 26 (Armonk, NY: IBM Corp) was used for the analysis. Data missing due to incomplete participant information (i.e., age, previous education, and experience working in community pharmacies) were excluded from the analysis.

For the Chi-square test, two key assumptions were ensured: the independence of observations and that the expected frequency in each cell was greater than 5. If any expected frequency was below 5, Fisher's Exact Test was used. For logistic regression, the assumption of multicollinearity was assessed by examining the Variance Inflation Factor (VIF) and Tolerance values. A VIF greater than ten or a Tolerance value less than 0.1 indicates problematic multicollinearity (Field, 2009). Results of the multicollinearity test (VIF and Tolerance values) are provided in Appendix C.

Results

Content validity index and reliability results of the questionnaire

All three experts consistently rated the relevance of questionnaire items to the constructs as three or four. Therefore, after dichotomising the rating, the I-CVI, S-CVI/Ave, and S-CVI/UA were all equal to 1, indicating that the items could be considered relevant to the construct. The overall scale exhibited good internal consistency, with a Cronbach's alpha of 0.902. The results of Cronbach's alpha per construct were 0.846 for performance expectancy, 0.699 for effort expectancy, 0.7 for social influence, 0.744 for facilitating condition, 0.908 for hedonistic motivation, and 0.855 for behavioural intention to use the SMCL-chatbot.

Study participants

The population of students enrolled in the "Responding to Symptoms" was 237. Of these, 201 participated in the study (including participants in the pilot study). The response rate was 84.8%. Of the 237 students, 36 did not complete the questionnaire. Among these 36 students, 25 did not attend the laboratory session in week eight and did not respond to the WhatsApp group invitation. The other 11 of these 36 students attended the session but did not fill out the questionnaire. However, according to the school database, the demographic characteristics of these 36 students, such as age and gender, were similar to those of the participating students. Therefore, the perceptions of the non-participating students might not differ significantly from those of the participating students. Most of the participating students were female (85%), had a mean age of 20, graduated from high school (78%), and had a mean GPA of 2.8. A majority of students (79%) had no experience of training or working in community pharmacies. Details related to participants' characteristics are presented in Table III.

Students' intention to use the interactive AI chatbot and the contributing factors

Overall, most students provided positive responses regarding each construct of the adapted UTAUT2 model (Table II, Figure 2). About 90% of the 201 participating students provided positive responses regarding their intention to use the SMCL-chatbot for learning self-medication consultation in the future or to recommend this technology to others.

Of the 201 participating students, 91% to 93% agreed that using this SMCL-chatbot can help them learn and improve their capacity to learn self-medication consultation (i.e., performance expectancy) and about 94% to 95% stated that using this technology to learn self-medication consultation is interesting and enjoyable (i.e., hedonistic motivation). Furthermore, of the 201 participants, 87 to 96% agreed that this SMCL-chatbot is easy to use (i.e., effort expectancy), 88 to 96% agreed that they have the necessary facilities and help to support them using the SMCL-chatbot (i.e., facilitating condition), and 63 to 72% agreed that they used this SMCL-chatbot because others encouraged them to do so (i.e., social influence) (Table II).

Table III: Participants' characteristics (n = 201)

Participants' characteristics	Number of students	
Gender		
Male	30	15%
Female	171	85%
Age in years; mean (SD)[†]	20	(1.02)
Previous education[*]		
High school	156	78%
Pharmacy assistant school or other vocational school (equivalent to high school)	44	22%
GPA (out of 4)		
Less than 2	9	5%
2 to less than 2.5	53	26%
2.5 to less than 3	63	31%
3 and above	76	38%
Mean GPA (SD)	2.8	(0.55)
Have any experience of working or training in community pharmacies[**]		
Yes	41	21%
No	155	79%

[†]Calculated from 195 students;[*]Calculated from 200 students; [**]Calculated from 196 students

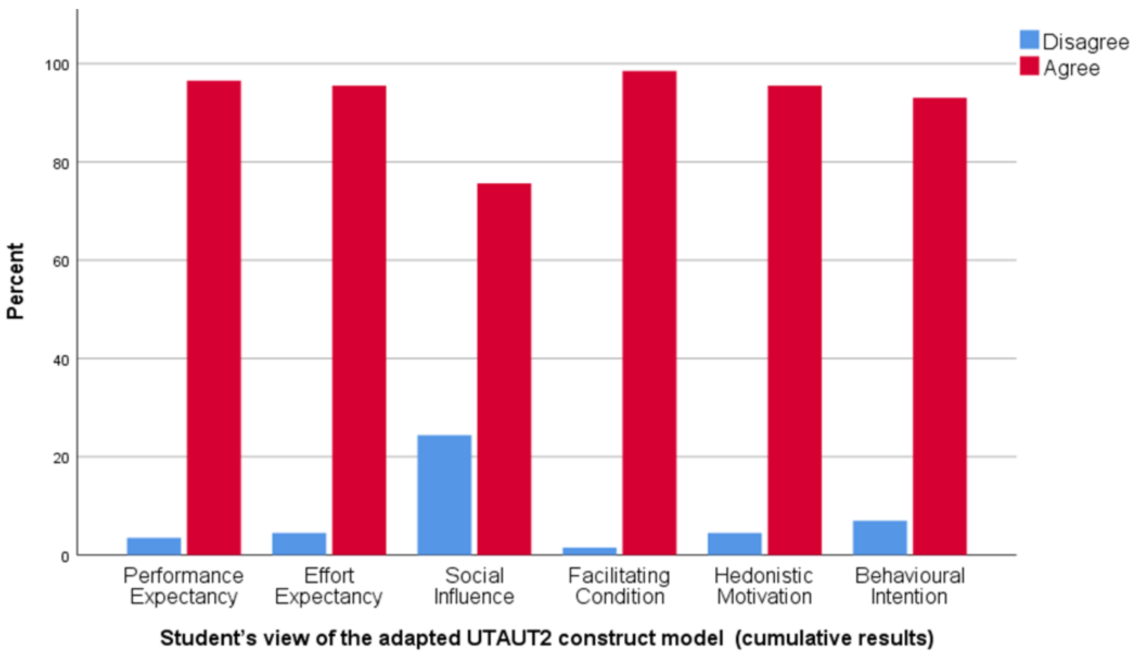

Figure 2: Students' view of the adapted UTAUT2 construct model after the data was dichotomised based on the total score for each construct

Figure 2 presents the percentages of students who agreed or disagreed with each construct of the modified UTAUT2 model after the data were dichotomised based on the total score for each construct. Regarding willingness to pay, only 196 participants answered the questions. Of these 196 participants, 122 (62%) stated that they only want to pay IDR 50.000 or less per semester for using this technology (Table IV).

Table IV: Students' willingness to pay for using the interactive chatbot AI (n = 196)†

Willingness to pay	Number of students
Not pay anything	19(10%)
IDR 50.000 or less	103(52%)
IDR 51.000 to 100.000	31(15%)
IDR 101.000 to 150.000	21(10%)
More than IDR 150.000	22(11%)
Median	IDR 50.000
Mean (SD)	IDR 102.000 (187.000)
Maximum value that is stated	IDR 1.000.000

†Of the total 201 participants, five participants did not provide answers and therefore analysis was conducted for 196 participants.

The chi-square test showed that performance expectancy, effort expectancy, facilitating conditions, and hedonistic motivation were individually related to the intention to use the SMCL-chatbot. Further, multivariate analysis confirmed that only performance expectancy (OR: 16.5, 95% CI: 1.42-192.42, p: 0.025) and hedonistic motivation (OR: 19.4, 95%CI 2.60-144.63, p: 0.004) were associated with students' intention to use the SMCL-chatbot (Table V). Other variables such as gender, age, previous education, experience of training or working in community pharmacies, Grade Point Average (GPA), Effort Expectancy, Social Influence, and Facilitating Condition were not associated with the intention of students to use the SMCL chatbot.

Table V: Univariate and multivariate analysis of factors related with students' intention to use the interactive AI chatbot

Factors	Results of Chi-square test (n = 201) Behavioural intention to use the interactive AI chatbot				Results of multivariate analysis (n = 195)	
	Positive (n)	Negative or neutral (n)	Total (n = 201)	*P*-value	OR (95% CI)	*P*-value
Gender						
Male	29	1	30	0.350		
Female	158	13	171			
Age†						
20 years old or less	119	6	125	0.163		
More than 20 years old	63	7	70			
GPA (on a 4 scale)						
Less than 2.8	94	9	103	0.311		
2.8 or more	93	5	98			
Previous education†						
High School	148	8	156	0.138		
Pharmacy assistant school or other vocational school	39	5	44			
Having work experience in community pharmacies						
Yes	38	3	41	0.537		
No	145	10	155			
Performance expectancy						
Agree responses	185	9	194	**0.000**	16.5 (1.42 – 192.42)	**0.025**
Disagree or neutral responses	2	5	7			
Effort expectancy						
Agree responses	183	9	192	**0.000**		
Disagree or neutral responses	4	5	9			
Social Influence						
Agree responses	144	8	152	0.095		
Disagree or neutral responses	43	6	49			
Facilitating condition						
Agree responses	186	12	198	**0.013**		
Disagree or neutral responses	1	2	3			
Hedonistic motivation						
Agree responses	184	8	192	**0.000**	19.4 (2.60 – 144.63)	**0.004**
Disagree or neutral responses	3	6	9			

†Calculated from 195 students;

Discussion

This study found that the majority of pharmacy students at the University of Surabaya have a positive intention to use the SMCL- chatbot, which is similar to other findings (Baker *et al.,* 2024; Busch *et al.,* 2024; Iwasawa *et al.,* 2023; Risana *et al.,* 2024). The positive view of students toward AI in healthcare education can be attributed to several factors. These include significant advancements in the healthcare field, increased excitement about studying, assistance with administrative tasks, academic support (such as answering course-related queries), and enhanced simulated learning experiences (Baigi *et al.,* 2023; Labrague & Sabei, 2025). While many studies in healthcare education generally show a positive attitude toward AI, a few have reported negative perceptions. For instance, Braindes (2020) found that 53% of medical students viewed AI as a threat to the radiology job market. Similarly, Boillat (2022) highlighted concerns among medical students about the potential reduction in doctors' skills and the dehumanisation of healthcare due to AI. Nevertheless, numerous studies, including this one, demonstrate a largely positive view of the benefits AI brings to healthcare education (Baigi *et al.,* 2023).

Regarding willingness to pay, 62% of students thought that the SMCL-chatbot technology should be available at no cost or cost no more than IDR 50.000 (about USD 3) for a semester of access. This amount is roughly equivalent to two or three regular meals at a school canteen. Literature related to students' willingness to pay for using AI in educational settings is limited. An article on students' willingness to pay for ChatGPT indicated that socio-economic characteristics including being male, older age, having higher income and savings, and using ChatGPT for commercial purposes were related to a higher percentage of students' willingness to pay for the technology (Lupa-Wojcik, 2024). Given students' low willingness to pay, exploring funding strategies for the long-term development and maintenance of AI technologies is needed within this context. While funding was available for this study to pilot the SMCL-chatbot, the sustainability of this technology warrants consideration since the institution or students will need to bear the ongoing cost. An option for cost efficiency might include seeking grants and partnerships with industry. Scaling the technology through collaboration with other pharmacy education institutions or centralising AI development and maintenance for pharmacy education nationwide might also be options, since these strategies allow cost-sharing and reduce effort duplication. Conducting a cost-benefit analysis, such as comparing the cost of AI development and maintenance to students' improved learning outcomes, will be important to justify the continued use of this technology (Ananyi & Somieari-Pepple, 2023).

Studies on the factors relating to the acceptance of information technology, including AI in educational settings, based on the UTAUT or UTAUT2 model, showed context-dependent variations (Acosta-Enriquez *et al.,* 2024; Xue *et al.,* 2024; Yee & Abdullah, 2021). Our multivariate analysis showed that performance expectancy was significantly associated with students' intention to use the SMCL-chatbot, suggesting that students perceived this technology would improve their learning performance. This finding aligns with many studies across continents, which also found a significant association between performance expectancy and students' behavioural intention to use information technology (Huynh *et al.,* 2023; Zacharis & Nikolopoulou, 2022). Furthermore, this study found that hedonistic motivation was strongly associated with students' intention to use the SMCL-chatbot, aligning with Strzelecki's (2023) findings, where a positive relationship between hedonistic motivation and students' intention to use ChatGPT was observed. In contrast, Grassini (2024) found no such relationship. This discrepancy may stem from differences in the timing of data collection. Strzelecki's data was collected shortly after the launch of ChatGPT, which likely generated excitement and novelty among students. In contrast, Grassini's data was collected later, possibly reducing the perception of ChatGPT as a fun or novel tool due to habituation. Since this present study collected the first-time experience of students using such technology in the classroom, they likely felt excitement, pleasure, and enjoyment from using an advanced tool they had not experienced before. However, further studies are needed to determine whether this hedonistic motivation persists over time.

This study found that only 63% to 72% of participants agreed or strongly agreed that social influence affected their intention to use the SMCL-chatbot (Table II), which was notably lower than for other constructs. Additionally, social influence was not significantly associated with students' intention to use the SMCL-chatbot (Table V). This finding aligns with Grassini (2024), who also reported no association between social influence and students' intention to use ChatGPT. This lack of influence from social factors may be because students' decisions to use the SMCL-chatbot were driven more by their perception of its benefits for learning and personal enjoyment, rather than by influence from others.

There are benefits and limitations to this SMCL-chatbot software. Designed to mimic a patient, this SMLC-chatbot helps meet the needs of students practising self-medication consultation in large classes. Using this SMLC-chatbot gives each student an equal opportunity to learn information gathering and advice provision in a more standardised way compared to their untrained peers. In this context, self-medication consultation training typically involves an untrained student portraying a simulated patient, while another student takes on the role of a pharmacist. However, these untrained students may not consistently present the same symptoms or emotional responses as those described in the script. This can create confusion for learners trying to diagnose or engage with the simulated patient. As a result, using the SMCL-Chatbot, which is trained to act as a patient, is expected to provide more consistent responses compared to untrained students. Additionally, the SMCL-Chatbot allows students to review their recorded interactions with the AI, allowing them to reflect on both the strengths and weaknesses of their counselling skills. However, the newly developed SMCL-Chatbot still requires lecturers to manually assess and review students' recorded conversations, creating a significant workload outside of class (approximately two to three full working days for a lecturer to briefly review the conversations of 200 students). Peer review or group feedback might be a solution to reduce the burden. While human oversight is necessary, future development in AI technology to assist with reviewing or evaluating these conversations, including feedback provision, would be beneficial (Butow & Hoque, 2020).

Although this SMLC-chatbot could be used as a tool for student learning, it might not be able to replace human simulation completely. The depth of engagement, empathy, sympathy, and communication skills developed through human simulation cannot be replicated to the same extent by this SMLC-chatbot (Lou *et al.,* 2021; Montemayor *et al.,* 2022). This is because human simulation can interpret emotions, tone, and body language, enabling a more profound understanding beyond just words. In contrast, AI chatbots generate responses based on data patterns and algorithms, lacking genuine emotions and the ability to identify nuanced and communication cues (Oritsegbemi, 2023). Further qualitative research is needed to determine students' perception on the use of AI compared to the use of human simulation in the self-medication consultation training.

The development of this AI chatbot to support students' clinical skills training is particularly important in the context of Indonesian pharmacy education, where the duration of clinical training in community pharmacies is limited. Currently, many developing countries—such as Thailand, India, Nigeria, and Ghana—have adopted or are moving toward a six-year pharmacy curriculum (PharmD program) that provides more clinical training (Paraidathathu *et al.,* 2022; Peraman *et al.,* 2017; Nonyel & Ogbonna, 2022; Koduah *et al.,* 2020). However, Indonesia has not yet adopted this PharmD curriculum. To become a pharmacist in Indonesia, students complete a four-year BPharm program followed by a one-year Apothecary Program. The BPharm focuses mainly on lectures and laboratory work, while clinical training occurs during the Apothecary year through clerkships in various settings (Cokro *et al.,* 2021; Paraidathathu *et al.,* 2022). The total duration of these clerkships is typically around seven months, with training in community pharmacies allocated approximately two months (Paraidathathu *et al.,* 2022). This limited timeframe may limit students' ability to thoroughly develop their clinical skills. The SMCL chatbot may help address this issue by allowing students to practice these skills on their own.

Strengths and limitations

While numerous studies on AI have been published in recent years, no studies have specifically focused on using AI in teaching self-medication consultations for pharmacy students. This research, therefore, contributes to the body of knowledge. This research, however, has several limitations. This research is only conducted in one university, meaning that the generalisability of this research to other educational settings requires further investigation. Although good at identifying correlation, the cross-sectional study design does not imply causation. Furthermore, 36 students (15% of the population) did not participate, so their perceptions were not assessed. However, they shared similar demographics, such as age and gender, with the participating students, suggesting their perceptions might align with those of the general population who participated. In addition, including pilot study participants in the final sample could be seen as influencing final responses. However, since the pilot was conducted with the same population and no significant changes were made to the instrument, their inclusion is unlikely to impact the results significantly. Moreover, this study measured self-reported intentions, not actual usage and therefore further research is needed to measure actual usage. Furthermore, unlike other studies that examine students' knowledge or skill improvement after using a technology (Beshir *et al.,* 2022), this preliminary study has not assessed improvement in the students' competence after using this SMCL-chatbot. Further research is needed to examine whether this AI tool can improve students' competence in performing self-medication consultations. Also, future enhancements to the chatbot, such as expanding its capabilities by adding more cases, are needed.

Conclusion

Students had positive intentions to use this SMCL-chatbot; this suggests a readiness for the integration of this technology in educational settings as a tool to help students learn self-medication consultations. Performance expectancy (i.e., perceived benefit of using the AI chatbot for learning) and hedonistic motivation (i.e, pleasure and enjoyment from using the AI chatbot) were significant factors associated with students' intention to use the AI chatbot. However, students' willingness to pay for this SMLC-chatbot was low (62% of students were willing to pay only IDR 50,000 or less per semester); therefore, finding an appropriate funding model for future development and maintenance is necessary. Given that this study only measures self-reported intentions in one setting, an experimental study is needed to compare AI chatbot usage vs. non-usage in improving students' competence across different settings. Additionally, a cost-benefit analysis is required to justify the use of this technology.

Ethics Approval and Informed Consent

Ethics approval was obtained from the Ethical Committee University of Surabaya, Indonesia (No: 393/KE/VI/2024).

Conflict of interest

The authors declare no conflict of interest.

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Appendix A: Screenshot of the interactive AI chatbot

English Translation

My child has diarrhoea. What can you recommend?

How old is the child?

He is 4 years old

How long has the diarrhoea been started?

The diarrhoea started about 6 hours ago. He has gone to the toilet 3 times

Can you tell me more about the diarrhoea? What is the consistency of the stool?

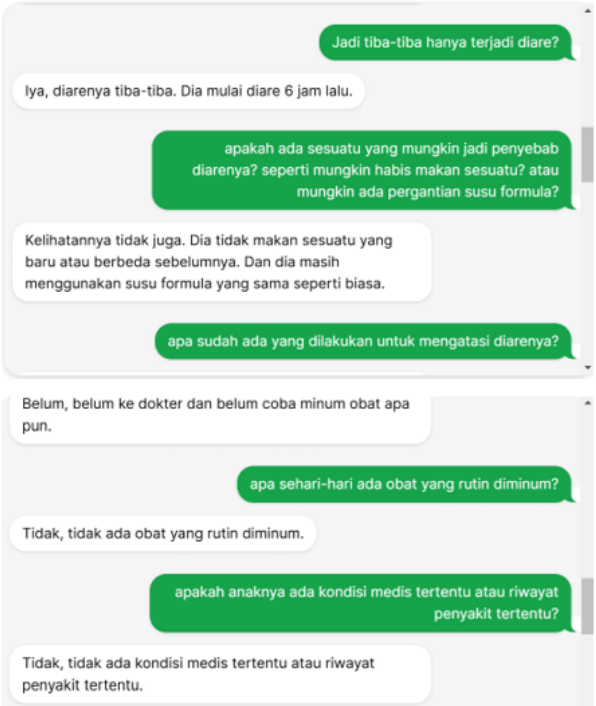
It was mushy, softer than usual

How is the condition of the child? Can he still play, drink and eat as usual?

Seems ok, he can play and drink as usual. Eating a little bit less than usual

Any symptoms other than diarrhoea?

No. There are no symptoms other than diarrhoea. He doesn't have any nausea vomiting, cough, runny nose, fever, or abdominal cramps



So the diarrhoea comes all of a sudden?

Yes, the diarrhoea occurs suddenly. It started 6 hours ago

Is there anything that might cause the diarrhoea? Does he eat something? Are there any changes in the formula milk that he used to drink?

I don't think so. He doesn't eat anything unusual or different from what he used to eat. He also still uses the same formula milk.

Is there anything that you have done for his diarrhoea?

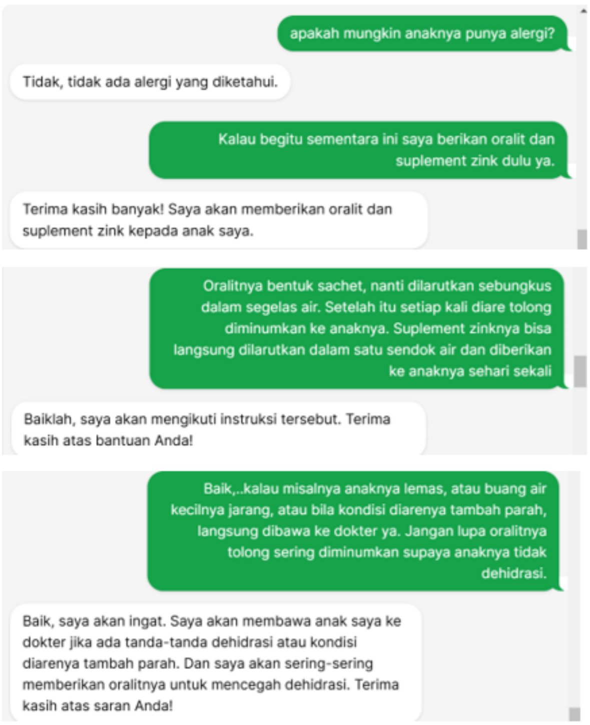
No. I haven't consulted a doctor nor given him any medicines

Does he use any routine medications?

No, he doesn't use any routine medications.

Does he have any medical conditions?

No, he doesn't have any medical conditions



Does he have any allergies?

No, he doesn't have allergies

In that case, I'll give oral rehydration salt (ORS) and zinc supplement

Thanks. I'll give them to him.

The ORS is in sachets, dissolve it first in a glass of water. Give it to the child every time he has diarrhoea. The zinc supplement can be dissolved in a spoon of water and given to the child once a day.

All right, I will follow your instructions.

If your child seems lethargic, urinates infrequently, or if the diarrhoea becomes worse, please consult a doctor. Also, don't forget to give him the ORS frequently to avoid dehydration.

All right, I'll remember that. I will take my son to a doctor if there are signs of dehydration or if the diarrhoea becomes worse. I will also give him the ORS frequently to avoid dehydration. Thanks for your advice!

Appendix B: Experience/expertise of the three experts validating the questionnaire

Experts	Experience/Expertise
Expert A	Survey methodology, Questionnaire validation, and Health education
Expert B	Survey methodology, Questionnaire validation, and Health education
Expert C	Survey methodology, Questionnaire validation

Appendix C: Results of the multicollinearity test (VIF and tolerance values)

Variables	Collinearity statistics	
	Tolerance	VIF
Gender	0.953	1.049
Age	0.673	1.485
GPA	0.680	1.470
Previous education	0.534	1.874
Having work experience in community pharmacy	0.575	1.740
Performance expectancy	0.438	2.281
Effort expectancy	0.475	2.104
Social influence	0.889	1.125
Facilitating condition	0.487	2.053
Hedonistic motivation	0.479	2.090

VIF: Variance inflation factor; GPA: Grade point average