

Development of Numeracy Problems with the Context of Herbal Medicines in Junior High School

Rahmah Johar^{1,2*}, Aini Wahyuna³, Erni Maidiyah⁴,
Ratu Fazlia Inda Rahmayani⁴, Fahlida Harnita⁵

^{1,3,4}Mathematics Education Department, Universitas Syiah Kuala, Indonesia

²The Research Centre of Realistic Mathematics Education, Universitas Syiah Kuala, Indonesia

⁵Chemistry Education Department, Universitas Syiah Kuala, Indonesia

*Email: rahmah.johar@unsyiah.ac.id

Received: 27 August 2022; Revised: 14 October 2022; Accepted: 31 October 2022

Abstract. Individuals with low immune systems have a higher impact on the Covid-19 outbreak. Herbal treatment is one of the solutions to reduce the risk of being infected by the virus. However, the public has not yet fully known about herbal medicines in Indonesia. One of the efforts to increase students' knowledge about herbal medicine is by developing numeracy questions in the context of herbal medicine. This study aims to produce valid and reliable numeracy questions in the context of herbal medicine for junior high school students and to find student responses to numeracy questions in the context of herbal medicine. The research method used is a design research type of development study with a Tessmer development model. The results of the study were 16 numeric questions with the context of herbal medicines that were valid in terms of content, construct, and language based on the validator's assessment, while nine of the 16 questions met empirical validity. The numeration question set in the context of herbal medicine has a high-reliability value. Based on the students' responses, the set of questions developed positively impacted students. The teacher can use these questions as an instrument to train students' numeracy ability.

Keywords: numbers, numeracy problems, the context of herbal medicines.

Introduction

Covid-19 a contagious epidemic disease caused by SARS-CoV-2 virus. This virus, first identified in November 2019 in Wuhan, Hubei Province, China, attacks the respiratory system. Spreading fast to many countries, the epidemic subsequently became a pandemic. WHO Emergency Committee declared a global health emergency on January 30, 2020, to raise awareness of Covid-19 cases in China and other affected countries (Velavan & Meyer, 2020).

Considering the rapid increase of Covid-19 cases, preventive measures should be taken by focusing on the symptoms and development of Covid-19 in patients. In severe cases, most Covid-19 cases show common symptoms such as high body temperature, nonproductive cough, sore throat, tiredness, headache, difficulty breathing, and loss of smell. However, symptoms that appeared two to fourteen days after being infected do not specifically indicate that there is an infection (Alimansur & Quyum, 2020). Therefore, maintaining a healthy immune system is very crucial.

Strengthening the immune system is believed to benefit everyone as one of the preventive measures for getting Covid-19, especially those susceptible to infection. Maintaining a healthy immune system can be achieved by consuming modern or traditional medicine. However, modern

medicine contains a synthetic chemical compound and has negative side effects. Therefore, herbal medicine is argued to be effective in strengthening the immune system and restoring one's health (Panyod, Ho, & Sheen, 2020).

Herbal medicine in Indonesia is classified into three types: jamu, standardized herbal medicine, and phytopharmaca. While jamu is a well-known traditional medicine, standardized herbal medicine and phytopharmaca are still uncommon to the general public. According to research, about 50% of Indonesians consume herbal medicine for medication or health care. Based on these findings, 55.3% of people take the liquid form of herbal medicine, while the rest consume the powder form (Andriati & Wahjudi, 2016).

A study on the public knowledge of herbal medicine shows that the majority (92%) of the public is informed about traditional medicine in general. However, when faced with a specific question about the classification of herbal medicine, most (88.2%) people know about jamu. In comparison, only 29.4% and 3% of the people know about standardized traditional medicine and phytopharmaca respectively. These findings indicate that information about traditional or herbal medicine is not yet widely disseminated in Indonesia (Pratiwi, Saputri, & Nuwarda, 2018). One of the steps to increase the public's knowledge about herbal medicine is education. Therefore, teachers are expected to develop students' ability to solve problems in herbal medicine context and increase students' numeracy.

Numeracy is the capacity to deal with quantitative aspects effectively (Steen, 2001). Numeracy is the ability to apply mathematical understanding to make a decision, solve problems, or explain real-life events to help students understand the use of mathematics in everyday events through logical thinking (Kemendikbud, 2020). Elements of numeracy include; confidence in mathematics, appreciation of the nature and history of mathematics and significance in understanding problems in the public domain, logical thinking and decision making, using mathematics to solve practical everyday problems in different contexts, the definition of numbers and symbols, reasoning with data and the ability to draw on a variety of prerequisite mathematical knowledge and tool (Dole & Geiger, 2020). Numeracy skill is the ability to acquire, apply, analyze, and communicate mathematical knowledge and concepts to participate in and deal with mathematical demands from various life situations (OECD, 2016). Numeracy skills are built based on real-life situations where a person needs to administer information and solve problems by responding to mathematical contents, ideas, or reasoning presented in various forms (Jonas, 2018).

Several previous studies have developed mathematical problems in various contexts; Jambi context (Charmila, Zulkardi, & Darmawijoyo, 2016); local wisdom context (Pamungkas, 2018); Covid-19 context (Saputri, Turidho, Zulkardi, Darmawijoyo, & Somakim, 2020); and Banyumas

and Cilacap tourism context (Dasaprawira, 2021). Previous researchers have also researched numeracy, including numeracy literacy in extracurricular activities and analysis of numeracy skills (Winata, Widiyanti, & Cacik, 2021). However, studies that develop numeracy problems within herbal medicine are still very limited. Based on the explanation above, this study aims to develop numeracy problems with the context of valid and reliable herbal medicine and to find out students' response on numeracy problems with the context of herbal medicine.

Method

This is a developmental research. The study applied Tessmer's (1993) developmental research model, which includes self-evaluation, expert review, one-to-one, small group, and field tests. Self-evaluation aims to determine the users' needs on numeracy problems within the context of herbal medicine. The expert review stage aims to validate the problems to obtain assessment and feedback from the experts. Whereas one-to-one and small-group stages are to test the readability of the problems. Finally, a field test is conducted to test the validity and reliability of the problems. The stages of Tessmer's development can be seen in Figure 1.

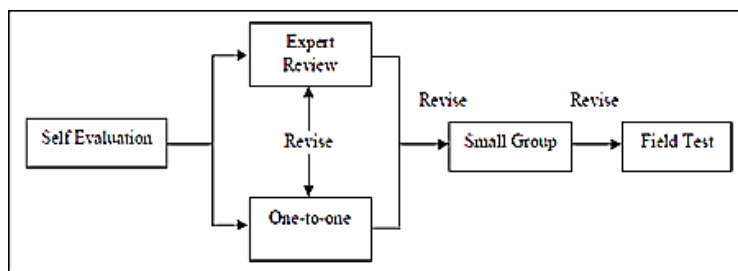


Figure 1. Tressmer's development model

The self-evaluation stage was conducted to determine whether numeracy problems in herbal medicine were necessary and were still not available as needed, so they needed to be developed. Analysis and designing are two phases that were carried out in this stage. The analysis phase aimed to review further the context in which the questions were being developed. Students, curriculum, materials, and documents relevant to developing numeracy questions in the context of herbal medicine were analyzed in this stage. Designing was the phase of compiling a prototype within the context of herbal medicine numeracy in accordance with the standards identified in the analysis phase. The questions' design considered three factors: content, construct, and language.

The purpose of the expert review phase was to assess the designed questions by the validator. The validator received prototype I to be validated. The validator provided feedback on prototype I. Suggestions and feedback received from the validator were considered when making revisions to prototype I. Four validators provided input on the questions developed: a numeracy expert, a school mathematics learning expert, and a teacher experienced in

developing questions. The validity was assessed as theoretical validity, which includes the validity of content and constructs. The aspect of language accuracy was also measured in this study.

The one-to-one phase aimed to test the readability of questions on students. This stage involved three students reading and examining the questions and then responding to the questions' readability and clarity. Findings from this stage were also used when revising prototype I. The revised version of prototype I is identified as prototype 2.

The next step was testing prototype 2 on students in the small group stage. In the small group stage, six students with various competencies were asked to share their opinions about the questions they had worked on. Afterwards, prototype 2 was revised again following the data of students' responses and comments on the questions. The result of the revision of prototype 2 was called prototype 3. Next, a field test was conducted to test the validity and reliability of the questions in prototype 3. In this phase, students were asked to complete the questions within 120 minutes.

The research instruments were the question validation sheet, open-ended interview guide sheet, field note, and students response questionnaire. The question validation sheet contained the validity characteristics of the questions adopted from Lewy, Zulkardi, and Aisyah (2009), as shown in Table 1. The interview guide was used to obtain the readability of the data on students' understanding of the questions. Field notes were used to record data supporting the questions' readability during interviews and tests.

Table 1. Components of question validity test

Content	Construct	Language
The questions measure the ability to think critically based on:	Questions are in accordance with the supporting theory and criteria:	In accordance with <i>Pedoman Umum Ejaan Bahasa Indonesia (PUEBI)</i> (General Guidelines for Indonesian Spelling)
- Basic Competency - Indicator - Learning Objective	- Develop the ability to analyze, evaluate, or create - Rich in concept - In accordance with the middle school students' level - Stimulate further development of the concept	- Questions are straightforward - Questions are not ambiguous - Clear boundaries of questions and answers - Use common language

The analysis at expert review, one-to-one, and small group stages was conducted descriptively, analyzing, describing, and summarizing the collected data. In addition, the analysis was also carried out at the field test stage, namely testing the validity and reliability of the items and analyzing the students' responses..

Results and Discussion

This study adopted Tressmer's development model to develop the questions. The developed numeracy problems within the context of herbal medicine were expected to meet the aspects of validity and reliability. Stages in developing questions are discussed in this section. The stages are self-evaluation, expert review, one-to-one, small group, and field test. The following are the results at each stage.

The self-evaluation stage was related to the analysis and design of the questions, which include grids and numeracy questions in the context of herbal medicine. Based on the literature review and interviews with several teachers, it was concluded that the availability of numeracy questions within herbal medicine is still limited. Hence, developing numeracy problems in herbal medicine is believed to be important. Consequently, numeracy problems with the context of herbal medicine were designed. To get information about herbal medicine, the author carried out an internship program at one of the herbal medicine companies in Aceh Besar, Indonesia, for one month. Through these activities, information was obtained about the cultivation, processing, and packaging of herbal medicines. There are 16 questions with six stimuli, namely sales of herbal drinks, packaging of herbal medicines, sales of herbal medicines, cultivation of herbal plants, processing of herbal plants, and exporting of herbal medicines.

In the expert review phase, prototype I was given to the validator to be validated based on the content, construct, and language component. Besides that, in the one-to-one phase, the students were assigned to read and review the questions on prototype I. This way, the researchers could analyze their responses to the questions' readability and clarity. Based on the interview results with students and the validator's suggestions, revisions were made to prototype I, as presented in the description below.

Stimulus 1 (question number 1 through 3)

Questions 1 through 3 applied stimulus with the context of sales of processed herbal drinks. The revisions made to these questions can be seen in Table 2.

Table 2. Revisions to questions on stimulus 1

Validators' Comments	Students' Comments	Decision to Revise
Validator 1: - The writing of the product price "Rp32.000" should be "32.000,00". - Should pay attention to punctuation, capital letter, and misspelled words.	- The questions are interesting and challenging, Mam. - The stimulus is a bit hard to understand, especially in the part of "<i>menjual teh jahe dua kali harga jamu</i>", Mam - The directions of the question are easy to follow	The stimulus is revised as follows: <i>"Beberapa toko menjual jamu dan teh jahe dengan harga yang sama. Jamu dijual dengan harga Rp32.000,00 per botol dan satu kotak teh jahe dijual dengan harga dua kali lipat dari harga jamu. Toko-toko</i>

Validator 2:	• It is hard to determine the price of the herbal product in question number 2.	<i>tersebut memberikan diskon yang berbeda-beda untuk setiap botol jamu dan teh jahe seperti pada tabel di bawah ini.”</i>
• The presentation of the images on stimulus is not clear.		

Stimulus 2 (questions number 4 through 6)

Questions 4 through 6 used stimulus in the context of packaging herbal medicine. The revisions made to these questions can be seen in Table 3.

Table 3. Revisions to questions on stimulus 2

Validators' Comments	Students' Comments	Decision to Revise
Validator 1:	• The first statement in question number 4 is quite unclear, Mam	• Revisions on statements in question number 4 (1) <i>Sebuah kemasan memuat 960 gram lengkuas bubuk. Bruto kemasan lengkuas tersebut tidak sama dengan netto nya.</i> (2) <i>Sisa lengkuas bubuk yang belum dikemas adalah 20 gram.</i> (3) <i>Jika sebuah kardus memuat 12 kemasan lengkuas bubuk maka netto kardus tersebut adalah 1200 gram.</i>
• Many of the statements in question number 4 are still lacking.		

Stimulus 3 (questions number 7 through 9)

Questions 7 through 9 used stimulus in the context of herbal medicine sales. Revisions made to these questions are presented in Table 4.

Table 4. Revisions to questions on stimulus 3

Validators' Comments	Students' Comments	Decision to Revise
Validator 1:	• Information on the image presented is not clear.	• Revise the image on the stimulus
• The image display is not visible.		• Revise the language on question number 7:
• Statements on question number 7 and number 9 are not effective.	• Question number 9 is difficult to understand.	<i>“Seorang warga Desa Krueng ingin membeli kunyit bubuk sebanyak 1 kg di toko Pak Toni. Kemasan yang dipilih warga tersebut untuk mendapatkan harga termurah adalah”</i>
Validator 2:		• Revise the language on question number 9:
• The image presented is not visible.		<i>“Berdasarkan jangka waktu penyimpanan bubuk kunyit. Apakah keputusan pak Toni terkait pengemasan bubuk kunyit benar? Jelaskan alasanmu!”</i>
• The language on question number 7 and number 9 needs to be revised.		
Validator 3:		
• The image presented is not visible.		
• The language on question number 7 and number 9 needs to be revised.		

Stimulus 4 (questions number 10 and number 11)

Question number 10 and 11 used stimulus in the context of cultivation of herbal plants. Revisions made to these questions are displayed in Table 5.

Table 5. Revisions to questions on stimulus 4

Validators' Comments	Students' Comments	Decision to Revise
Validator 1: - Avoid typographical errors. - The statement in question number 11 is not effective. Validator 2: - The language in the question is not communicative.	- The image on the stimulus has no description. - What does the word "pasca" in question number 10 mean, Mam? - Question number 11 is difficult to understand.	- Add a description of the image. - Revise the language on question number 11: <i>"Agar dapat melakukan penyemaian bibit kunyit dengan baik, calon bibit harus dipotong menjadi 2-3 bagian untuk tahap awal. Pak Ali memiliki 122 bagian potongan calon bibit untuk disemai. Sebelum dipotong Pak Ali memiliki calon bibit sebanyak ... batang."</i>

The stimulus 4 and its questions after revision can be seen in Figure 2 and Figure 3.

Bacalah teks di bawah ini untuk menjawab soal nomor (10) dan (11)!

Budi Daya Tanaman Kunyit

Budi daya tanaman bertujuan agar tanaman tumbuh dengan baik. Ada 6 teknik budidaya tanaman yaitu pembibitan (penyemaian), pengolahan tanah, penanaman, pemeliharaan, panen, dan setelah panen. Salah satu teknik budi daya tanaman kunyit yaitu penyemaian.



Gambar Penyemaian Bibit Kunyit

Sumber : GDM Organik

Penyemaian bibit kunyit dilakukan dengan tujuan agar bibit dapat tumbuh dengan maksimal dan bisa lebih mudah dalam melakukan pengontrolan. Selain itu, tujuan yang paling utama adalah supaya bibit kunyit dapat beradaptasi dengan mudah di lahan atau di dalam pot.

Agar dapat melakukan penyemaian bibit kunyit dengan baik, prosedur yang dilakukan adalah sebagai berikut :

- 1) Calon bibit dipotong menjadi 2-3 bagian, yang masing-masing bagiannya memiliki tunas yang baik, setidaknya 1-3 tunas, dengan berat 20-30 gram dan panjang 3-7 cm.
- 2) Letakkan di tanah yang cukup lembab ($25-28^{\circ}\text{C}$) selama 1-2,5 bulan agar pertumbuhan tunas dapat semakin cepat.
- 3) Jangan lupa untuk memberikan penyiraman 2 kali sehari, pada pagi dan sore hari.
- 4) Biarkan tunas tumbuh dan bibit siap untuk di tanam.

(a)

Read the text below to answer questions number (10) and (11)!

Cultivation of Turmeric Plants

Plant cultivation aims for plants to grow well. There are 6 techniques of plant cultivation, namely seeding (seeding), tillage, planting, maintenance, harvesting, and post-harvest. One of the turmeric cultivation techniques is seeding.



Figure: Turmeric Seedling

Source: *Organic GDM*

Turmeric seedling is done so that the seeds can grow optimally and be easier to control. In addition, the main goal is that turmeric seeds can adapt easily in the field or pots. For the seeding of turmeric seeds to run well, the procedure is as follows:

- 1) Prospective seedlings are cut into 2-3 parts, each of which has good shoots, at least 1-3 shoots, weighing 20-30 grams and 3-7 cm long.
- 2) Place it in moderately moist soil (25-28)⁰C for 1-2.5 months so that shoot growth can be faster.
- 3) Do not forget to give watering 2 times a day, in the morning and evening.
- 4) Let the shoots grow and the seeds are ready for planting.

(b)

Figure 2. Stimulus 4 after the revision in Bahasa (a) and in English (b)

10. Pernyataan-pernyataan berikut berkaitan dengan penyemaian bibit kunyit. Berilah tanda centang (✓) pada setiap pernyataan yang benar dan berilah tanda (x) pada pernyataan yang salah!

☐

Calon bibit yang sudah dipotong diletakkan di ruangan dengan suhu 27⁰C selama 80 hari.

☐

Jika satu wadah semai kunyit memuat 250 kg, wadah yang dibutuhkan untuk 3 ton adalah 7 wadah.

☐

Penyiraman pertama dilakukan Pak Anhar pada hari senin pagi maka penyiraman kesebelas dilakukan pada hari sabtu pagi.

11. Agar dapat melakukan penyemaian bibit kunyit dengan baik, calon bibit harus dipotong menjadi 2-3 bagian untuk tahap awal. Pak Ali memiliki 122 bagian potongan calon bibit untuk disemai. Sebelum dipotong Pak Ali memiliki calon bibit sebanyak batang.

(a)

10. The following statements relate to turmeric seedlings. Put a check mark (✓) on each correct statement and put a tick (x) on the false statement!

☐ Prospective seedlings that have been cut are placed in a room with a temperature of 270C for 80 days.

☐ If one container of turmeric seedlings contains 250 kg, the containers needed for 3 tons are 7 containers.

☐ The first watering was carried out by Mr. Anhar on Monday morning, the eleventh watering was carried out on Saturday morning.

11. To be able to seed turmeric seeds properly, the prospective seeds must be cut into 2-3 parts for the initial stage. Pak Ali has 122 pieces of prospective seeds for sowing. Before being cut, Mr. Ali had as many as prospective seeds.

(b)

Figure 3. Questions number 10 and number 11 in Bahasa (a) and in English (b)

Stimulus 5 (question number 12 and 13)

Question number 12 and 13 used stimulus in the context of the processing of herbal plants. Revisions made to these questions are presented in Table 6 below.

Table 6. Revision to questions on stimulus 5

Validators' Comments	Students' Comments	Decision to Revise
Validator 1:		
- Stimulus is too difficult to understand. - Instructions in question number 12 and 13 are still ambiguous.	The question is difficult to understand because the content of curcumin per gram is not discussed.	Simplify the language in the stimulus and questions.
Validator 2:		
The language is barely communicative.	The questions are difficult due to many comma numbers resulting in difficulty in calculating.	Use more simple numbers in the questions.
Validator 3:		
- The image presented is not visible. - Requires editing for question number 12.	The language in the questions is not simple.	

Stimulus 6 (question number 14 through 16)

Questions 14 through 16 used stimulus with the context of exporting statistics of herbal medicine. Revisions made to these questions are displayed in Table 7.

Table 7. Revisions to question on stimulus 6

Validators' Comments	Students' Comments	Decision to Revise
Validator 1:		
The language of the second statement on question number 15 is barely communicative.	What does the number on the x-line say, Mam?	- Revise the image on the stimulus - Revise the language of the second statement on question number 15:
Validator 2:		
The language of the second statement on question number 15 is barely communicative.		<i>"Total ekspor jahe persis sama dengan cengkih."</i>

Based on the revisions of prototype I, prototype 2 was created. Next was the small group stage. Six students with low, moderate, and high mathematical abilities participated at this stage. Students were assigned to review the items of the questions and asked to provide comments on the questions they had worked on. The students' responses at the small group stage and the revisions made to prototype 2 are displayed as follows.

Multiple-choice questions (question number 1, 6, and 14)

Three questions were developed with multiple-choice types, namely questions 1, 6, and 14. The students' responses showed that the students were not constrained in answering multiple-choice questions. The student's answer to one of the multiple-choice questions. The student's answer to one of the multiple-choice questions is presented in Figure 4.

Andi ingin membeli Jamu dan Teh Jahe di toko yang sama. Agar mendapat harga yang paling murah, Andi harus berbelanja di toko.... A. Toko Berkah B. Toko Jaya C. Toko Jamu Herbal ☒ D. Toko Teh Modif

(a)

Andi wants to buy herbs and ginger tea at the same shop. In order to get the cheapest price, Andi had to shop at the store.... A. Berkah Shop B. Jaya Shop C. Jamu Herbal Shop ☒ D. Teh Modif Shop

(b)

Figure 4. Student's response to question number 1 (a) and its translation (b)

Complex multiple-choice questions (question number 2, 4, 10, 12, and 15)

Five questions were developed with complex multiple-choice types, namely questions 2, 4, 10, 12, and 15. Students' responses indicated that students were constrained in answering the questions. As a result, several questions were revised due to uncommunicative language, namely questions 2, 4, 12, and 15. Student's answer to one of the complex multiple-choice questions is displayed in Figure 5. Figure 5 shows the inaccuracy of the student's answer on the third statement.

Berdasarkan teks di atas, tentukan benar atau salah pada setiap pernyataan berikut. Berilah tanda centang (✓) pada kolom BENAR dan berilah tanda silang (x) pada kolom SALAH pada setiap pernyataan!

Pernyataan	Benar	Salah
Harga ekspor Vanili selalu mengalami kenaikan	✓	
Total ekspor jahe sama dengan cengkih		X
Pala dan kapulaga memiliki total ekspor kedua tertinggi		X

(a)

Based on the text above, determine whether each of the following statements is true or false. Put a check mark (✓) in the TRUE column and put a tick (x) in the FALSE column for each statement!

Statement	True	False
Vanilla export prices always increase	✓	
Total exports of ginger are as the same as cloves		X
Nutmeg and cardamom have the second-highest total exports		X

(b)

Figure 5. Student's response to question number 16 (a) and its translation (b)

Long answer question (questions number 3, 9, 13, and 16)

Four questions were developed with the type of long answer questions, namely questions 3, 9, 13, and 16. Students' responses indicated that students were constrained in answering these questions. Therefore, some questions were revised due to difficulty understanding the meaning or term used on questions 3, 9, and 13. Student's answer to one of the long answer questions is illustrated in Figure 6. Figure 6 shows that students only wrote what was known and what was asked, but not the solution to the problem.

apa itu suplementasi?

2. Percobaan klinis lain di Inggris menemukan bahwa suplementasi kurkumin mulai dari 0,45 gram hingga 3,6 gram per hari selama empat bulan, umumnya ditoleransi dengan baik oleh orang-orang dengan kanker kolorektal lanjut. Jika seseorang penyakit kanker mengkonsumsi kolorektal? induk kunyit bubuk selama 7 bulan (3 kali sehari = 1,35 gram induk kunyit bubuk), berapa persen kurkumin yang ia konsumsi selama 7 bulan?

Jawab :

Dik: kurkumin 0,45 gram hingga 3,6 gram per hari
Dit: berapa persen kurkumin yang ia konsumsi selama 7 bulan?

Jawab: 945 kg

(a)

what is supplementation?

Another clinical trial in the UK found that curcumin supplementation ranging from 0.45 grams to 3.6 grams per day for four months was generally well tolerated by people with advanced colorectal cancer. If a cancer patient consumes turmeric powder for 7 months (3 times a day = 1.35 grams of turmeric powder), what percentage of curcumin does he consume for 7 months?

Answer:

given: curcumin 0.45 grams to 3.6 grams per day
asked: what percentage of curcumin did he consume for 7 months?

Answer: 945 kg

(b)

Figure 6. Student's response to question number 13 (a) and its translation (b)

Matching question (questions number 5 and 8)

Two matching questions were developed, which is question number 5 and 8. Students' responses indicated that students were not constrained in answering these questions. Student's answer to one of the matching questions is presented in Figure 7. The student's response illustrated that there were two inaccurate answers.

Pasangkan jenis kemasan dan hasil konversi satuan massa kunyit bubuk yang paling cocok pada kolom dibawah ini!

Jenis kemasan		Ukuran satuan kg	
Kemasan A	☐	☐	0,1 kg
Kemasan B	☐	☐	0,2 kg
Kemasan C	☐	☐	0,3 kg
		☐	0,4 kg
		☐	0,5 kg

(a)

Pair the type of packaging and the results of the most suitable turmeric powder mass unit conversion in the column below!

Packing type		Mass unit size	
Packaging A	☐	☐	0.1 kg
Packaging B	☐	☐	0.2 kg
Packaging C	☐	☐	0.3 kg
		☐	0.4 kg
		☐	0.5 kg

(b)

Figure 7. Student's response to question number 5 (a) and its translation (b)

Short-answer question (questions number 7 and 11)

Two short-answer questions were developed; they are questions number 7 and 11. Student's responses showed that students were not constrained in answering this type of question. The student's answer to this type of question is presented in Figure 8.

Pak Toni seorang petani kunyit bubuk, ia menjual kunyit bubuk di tokonya dan memasang harga jualnya seperti pada brosur.

Jika kamu ingin membeli kunyit tersebut sebanyak 1 kg, kemasan yang kamu pilih untuk mendapatkan harga termurah adalah 1 bungkus bubuk kunyit yg satu kg (1kg)

(a)

Pabrik Olahan Herbal

Aneka Olahan Kunyit

Kopi kunyit	Rp15.000
Induk kunyit bubuk	Rp25.000
Bubuk kunyit 60 gram	Rp10.000
Bubuk kunyit 100 gram	Rp15.000
Bubuk kunyit 1 kg	Rp50.000

Aneka Bubuk

Bubuk cabe 100 gram	Rp15.000
Bubuk cabe 1 kg	Rp150.000
Bubuk jahe 1 kg	Rp120.000
Bubuk daun kari 80 gram	Rp15.000
Bubuk sereh 1 kg	Rp80.000
Bubuk lengkuas 1 kg	Rp80.000

Pak Toni is a turmeric powder farmer, he sells turmeric powder in his shop and puts the selling price as shown in the brochure.

If you want to buy 1 kg of turmeric powder, the packaging you choose to get the cheapest price is 1. pack of turmeric powder which is 1 kg

Pabrik Olahan Herbal

Aneka Olahan Kunyit

Kopi kunyit	Rp15.000
Induk kunyit bubuk	Rp25.000
Bubuk kunyit 60 gram	Rp10.000
Bubuk kunyit 100 gram	Rp15.000
Bubuk kunyit 1 kg	Rp50.000

Aneka Bubuk

Bubuk cabe 100 gram	Rp15.000
Bubuk cabe 1 kg	Rp150.000
Bubuk jahe 1 kg	Rp120.000
Bubuk daun kari 80 gram	Rp15.000
Bubuk sereh 1 kg	Rp80.000
Bubuk lengkuas 1 kg	Rp80.000

(b)

Figure 8. Student's response to question number 6 (a) and its translation (b)

After making revisions to prototype 2, prototype 3 was created. The next step was a field test. A total of 30 eighth-grade students in one of the junior high schools in Banda Aceh with heterogeneous abilities were asked to work on prototype 3 questions in 120 minutes. Afterward the validity and readability of the items were tested using Pearson correlation and Cronbach-Alpha formula, respectively. The results of the validity calculation of the questions are presented in Table 9.

Table 9. Results of the validity test

No of the question	r_{xy}	Sig.	Conclusion	No of the question	r_{xy}	Sig.	Conclusion
1	0,298	0,116	Invalid	9	0,735	0,000	Valid
2	0,719	0,000	Valid	10	0,220	0,252	Invalid
3	0,672	0,000	Valid	11	0,227	0,146	Invalid
4	0,008	0,966	Invalid	12	0,430	0,020	Valid
5	0,696	0,000	Valid	13	0,204	0,289	Invalid
6	0,687	0,000	Valid	14	0,663	0,000	Valid
7	0,531	0,003	Valid	15	0,109	0,575	Invalid
8	0,850	0,000	Valid	16	0,283	0,136	Invalid

Table 9 illustrates the analysis results on the validity of the questions. Out of 16 questions that were developed, nine questions were valid, and seven questions were Invalid. The result of the reliability test of the questions is 0,763. This showed that the numeracy questions in herbal medicine have high reliability.

Furthermore, students' responses were analyzed based on students' responses to numeracy problems in the context of herbal medicine in the form of a percentage. The analysis results on 52 students' responses to the questions developed were presented in Table 10.

The questionnaire results indicated that most students agreed that numeracy problems in herbal medicine were new. Students liked the idea of math problems that are related to everyday life, and they were interested in working on other numeracy problems in the context of herbal

medicine. The questions that were developed were relevant to their background knowledge, and the context of herbal medicine did not make them bored, but, in contrast, it encouraged them to explore further about the topic.

Table 10. The assessment of students' responses

No	Statement	Percentage of students' response
1	The given numeracy problems in the context of herbal medicine are new.	88,5%
2	Material presented in the numeracy problems within the context of herbal medicine is new.	84,6%
3	The context of herbal medicine presented in numeracy problems is new.	75%
4	The form of the question presented in the numeracy problems within the context of herbal medicine is new.	78,8%
5	The contextual problem presented in the numeracy problems within the context of herbal medicine is new.	80,8%
6	The presented context of herbal medicine is relevant to students' opinions or background knowledge.	55,8%
7	The selection of context about herbal medicine makes learning and working on the questions interesting.	63,5%
8	The selection of context about herbal medicine encourages students to explore more about herbal medicine in their area.	67,3%
9	Students like the idea of mathematical problems related to everyday life.	75%
10	Students are interested in working on numeracy problems in herbal medicine.	55,8%

The stages of developing questions that were carried out were self-evaluation, expert review, one-to-one, small group, and field tests. The self-evaluation process produced a set of numeracy questions in the context of herbal medicine. Questions developed were declared valid both theoretically and empirically (Wibowo & Faizah, 2021). Theoretical validity was obtained from the validation results of several validators at the expert review stage.

Furthermore, based on students' comments at the one-to-one stage and the analysis of students' answers at the small group stage, it was concluded that the students had understood the questions developed. Hence, these questions have been read and can be understood by students. These findings are in line with the research conducted by Purwanti, Syofiana, and Risnanosanti (2020) and Kamid, Saputri, and Hariyadi (2021). It is also supported by the findings from Harnita, Johar, and Oktari (2022), which measured the readability of questions by examining students' ability to understand the questions, which were easy to read and understand, and also examining the context, which was familiar to the students.

The empirical validity of the questions was obtained from the analysis of students' responses at the field test stage using a correlation test. The analysis showed that 9 out of 16 questions were valid. The valid items are questions 2, 3, 5, 6, 7, 8, 9, 12, and 14, while the invalid items are questions 1, 4, 10, 11, 13, 15, and 16. Based on the analysis of students' responses, questions number 1, 4, and 11 were considered easy by students, while questions number 10, 13, 15, and 16 were considered difficult by the students.

Several factors played a role in the reasons why the validity of the questions was not good enough. The first factor, considered the primary factor, was the presence of the difficult questions, which led students to rely on their guesses when working on multiple-choice questions and skipping the long answer questions. In contrast, considered easy questions made students careless and tended to underestimate the questions. Another factor was the time limit in working on the questions, which affected students to answer questions quickly but not accurately (Sobarningsih, Juariah, Nurdiansyah, Purwanti, & Kariadinata, 2019). Factors from students' answers can also affect the validity of the questions, namely the tendency of students to answer quickly without first studying the questions carefully, errors in calculating the value of an arithmetic operation, carelessness when working on the questions and doing trial and error in answering questions (Azizah, Hanifah, & Sumardi, 2021). In addition, numeracy problems with the context of herbal medicines that have been developed have a high level of reliability coefficient, so they are feasible for use. Based on these conditions, the invalid questions in this study were not discarded with the consideration that these questions have met content and construct validity based on the validators' opinions.

Herbs are medicinal plants grown and cultivated in Indonesia. Herbal medicine is an ingredient or concoction derived from plant, animal, mineral, extract preparations (galenic) or a mixture of these materials that have been used for generations to treat various diseases based on the norms prevailing in society (Dewati & Saputro, 2020). Herbal medicine can be an alternative to increase the immune system during the Covid-19 pandemic (Meilina, Dewi, & Nadia, 2020).

The use of the context of herbal medicine in the questions received a positive response from the students. This is evidenced in the analysis of the questionnaires, which indicated that most students believed that numeracy problems in the context of herbal medicine were new to them. A total of 55.8% of the students believed that the given context of herbal medicine was relevant to their background knowledge. They were eager to work on other numeracy problems in the context of herbal medicine. A total of 63.5% of the students considered the context of herbal medicine interesting, and 67% of the students were encouraged to learn more about herbal medicine available in their area. A total of 75% of students liked the idea of math problems that were related to everyday life.

Context is a situation in which a problem can be made more explicit, and related background knowledge is used to solve the problems (van den Heuvel-Panhuizen, 1996). The everyday life context is essential so that students can transform those problems in the context of mathematics (Khusna & Ulfah, 2021). The context applied to the questions could raise students' awareness of the role of mathematics in daily life. Working on questions in the daily life context could train students to solve problems around them (Khusna & Ulfah, 2021).

Conclusion

This study has developed numeracy problems in the context of herbal medicine for junior high school students. The questions were developed through several stages: self-evaluation, expert review, one-to-one, small group, and field test to obtain valid and reliable questions. A total of numeracy problems in the context of herbal medicine that have been developed were 16 items. Based on the results of the assessment of the validators, the questions that have been developed met the valid criteria in terms of content, construct, and language. However, based on the calculation of the empirical validity test, 9 out of 16 questions were declared valid. Based on the reliability, numeracy problems in herbal medicine have high reliability, 0.763. Based on the development process, analysis of responses, questionnaire, and the results of the interview with students, it can be concluded that students demonstrated a positive response towards the developed set of questions. This conclusion could be observed from the discovery that most students felt interested and demonstrated seriousness when answering the given questions. Teachers could use numeracy problems in the context of herbal medicine to explore students' mathematical abilities, especially numeracy skills.

The trial of the questions at the field test stage was given to 32 students of a favorite school in Banda Aceh, which led to some students considering the questions too easy, which impacted the questions' validity. It is recommended that more than 100 students should be involved in the trial stage. This study is limited to developing numeracy problems in herbal medicine. Future studies are expected to develop more numeracy problems with other social-cultural contexts to extend the integration of daily contexts in mathematics.

Acknowledgement

The authors are grateful for the financial support provided by Universitas Syiah Kuala, The Indonesian Ministry of Education, Culture, Research and Technology in accordance with the Letter of Agreement for Hibah Penelitian Merdeka Belajar Kampus Merdeka for the 2022 Fiscal Year Number: 147/UN11/SPK/PNBP/2022 dated 11 February 2022.

References

- Alimansur, M., & Quyum, E. (2020). Prevention efforts with compliance to the prevention of transmission of covid-19 to covid volunteers. *Journal of Public Health Research and Community Health Development*, 4(1), 81-87.
- Andriati, A., & Wahjudi, R. T. (2016). The acceptance rate of using herbal medicine in low-and-middle-income societies. *Society, Culture and Politics*, 29(3), 133-145.
- Azizah, N., Hanifah, H., & Sumardi, H. (2021). The analysis of the quality and cognitive level of mathematics questions at the assessment of end of odd semester (PAS) grade IX at SMPN 10 Bengkulu City academic year 2020/2021. *Mathematics Education*, 2(2), 51-60.

- Charmila, N., Zulkardi, Z., & Darmawijoyo, D. (2016). Pengembangan soal matematika model PISA menggunakan Konteks Jambi. *Jurnal Penelitian dan Evaluasi Pendidikan*, 20(2), 198-207.
- Dasaprawira, M. N. (2021). Pengembangan soal matematika tipe pisa menggunakan konteks wisata Banyumas dan Cilacap. *Prisma*, 10(1), 88-96.
- Dewati, R., & Saputro, W. A. (2020). Persepsi konsumen terhadap pembelian produk herbal di Kabupaten Sukoharjo. *AGRISAINTEFIKA: Jurnal Ilmu-Ilmu Pertanian*, 4(2), 144-152.
- Dole, S., & Geiger, V. (2020). *Numeracy across the curriculum: Research-based strategies for enhancing teaching and learning*. Routledge.
- Harnita, F., Johar, R., & Oktari, R. S. (2022, January). Readability of higher-order thinking (HOT) mathematical problems in disaster context for junior high school students. In *Eighth Southeast Asia Design Research (SEA-DR) & the Second Science, Technology, Education, Arts, Culture, and Humanity (STEACH) International Conference (SEADR-STEACH 2021)* (pp. 264-272). Atlantis Press.
- Jonas, N. (2018). Numeracy practices and numeracy skills among adults. *OECD Education Working Papers*, (177), 1-83.
- Kemendikbud. (2020). Desain pengembangan soal asesmen kompetensi minimum. In *Desain Pengembangan AKM*. Pusat Asesmen dan Pembelajaran.
- Kamid, K., Saputri, R., & Hariyadi, B. (2021). Pengembangan soal higher order thinking skills berbasis budaya Jambi. *Jurnal Cendekia: Jurnal Pendidikan Matematika*, 5(2), 1793-1806.
- Khusna, H., & Ulfah, S. (2021). Kemampuan pemodelan matematis dalam menyelesaikan soal matematika kontekstual. *Mosharafa: Jurnal Pendidikan Matematika*, 10(1), 153-164.
- Lewy, L., Zulkardi, Z., & Aisyah, N. (2009). Pengembangan soal untuk mengukur kemampuan berpikir tingkat tinggi pokok bahasan barisan dan deret bilangan di kelas IX akselerasi SMP Xaverius Maria Palembang. *Jurnal Pendidikan Matematika*, 3(2), 14-28.
- Meilina, R., Dewi, R., & Nadia, P. (2020). Sosialisasi pemanfaatan tanaman obat keluarga (toga) untuk meningkatkan imun tubuh di masa pandemi covid-19. *Jurnal Pengabdian kepada Masyarakat (Kesehatan)*, 2(2), 89-94.
- OECD. (2016). *PISA 2015 assessment and analytical framework: Science, reading, mathematic and financial literacy*. Paris: OECD.
- Pamungkas, A. S. (2018). Pengembangan instrumen kecakapan matematis dalam konteks kearifan lokal budaya Banten pada materi bangun ruang sisi datar. *Kreano, Jurnal Matematika Kreatif-Inovatif*, 9(1), 17-27.
- Panyod, S., Ho, C. T., & Sheen, L. Y. (2020). Dietary therapy and herbal medicine for COVID-19 prevention: A review and perspective. *Journal of traditional and complementary medicine*, 10(4), 420-427.
- Pratiwi, R., Saputri, F. A., & Nuwarda, R. F. (2018). Tingkat pengetahuan dan penggunaan obat tradisional di masyarakat: studi pendahuluan pada masyarakat di Desa Hegarmanah, Jatinangor, Sumedang. *Dharmakarya*, 7(2), 97-100.
- Purwanti, S., Syofiana, M., & Risnanosanti, R. (2020). Soal tentang bilangan bulat untuk mengukur kemampuan penalaran matematis. *Jurnal Pendidikan Matematika Raflesia*, 5(2), 145-152.
- Saputri, N. W., Turidho, A., Zulkardi, Z., Darmawijoyo, D., & Somakim, S. (2020). Desain soal PISA konten uncertainty and data konteks penyebaran covid-19. *EDU-MAT: Jurnal Pendidikan Matematika*, 8(2), 106-118.

- Sobarningsih, N., Juariah, J., Nurdiansyah, R., Purwanti, A. R., & Kariadinata, R. (2019). Pengembangan soal matematika bernuansa Islami. *Jurnal Analisa*, 5(2), 109-123.
- Steen, L. A. (Ed.). (2001). *Mathematics and democracy: The case for quantitative literacy*. Princeton, NJ: NCED.
- Tessmer, M. (1993). *Planning and conducting formative evaluations: Improving the quality of education and training*. London: Kogan Page.
- Van den Heuvel-Panhuizen, M. H. A. M. (1996). *Assessment and realistic mathematics education* (Vol. 19). Utrecht University.
- Velavan, T. P., & Meyer, C. G. (2020). The COVID-19 epidemic. *Tropical Medicine & International Health: TM & IH*, 25(3), 278-280.
- Wibowo, T. E., & Faizah, S. (2021). Pengembangan soal tes untuk mengukur kemampuan pemecahan masalah siswa pada materi bentuk aljabar. *Alifmatika: Jurnal Pendidikan dan Pembelajaran Matematika*, 3(2), 145-158.
- Winata, A., Widiyanti, I. S. R., & Cacik, S. (2021). Analisis kemampuan numerasi dalam pengembangan soal asesmen kemampuan minimal pada siswa kelas XI SMA untuk menyelesaikan permasalahan science. *Jurnal Educatio FKIP UNMA*, 7(2), 498-508.
- Winata, A., Widiyanti, I. S. R., & Cacik, S. (2021). Analisis kemampuan numerasi dan literasi membaca peserta didik kelas XI MA Islamiyah Senori Tuban. *Prosiding SNasPPM*, 6(1), 659-666.