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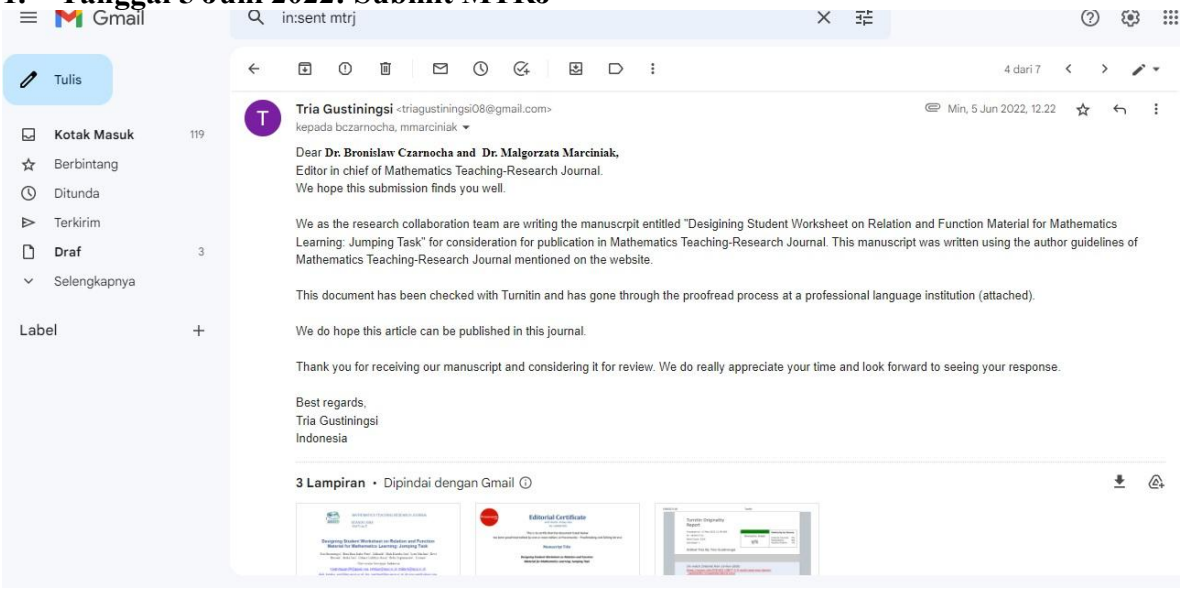

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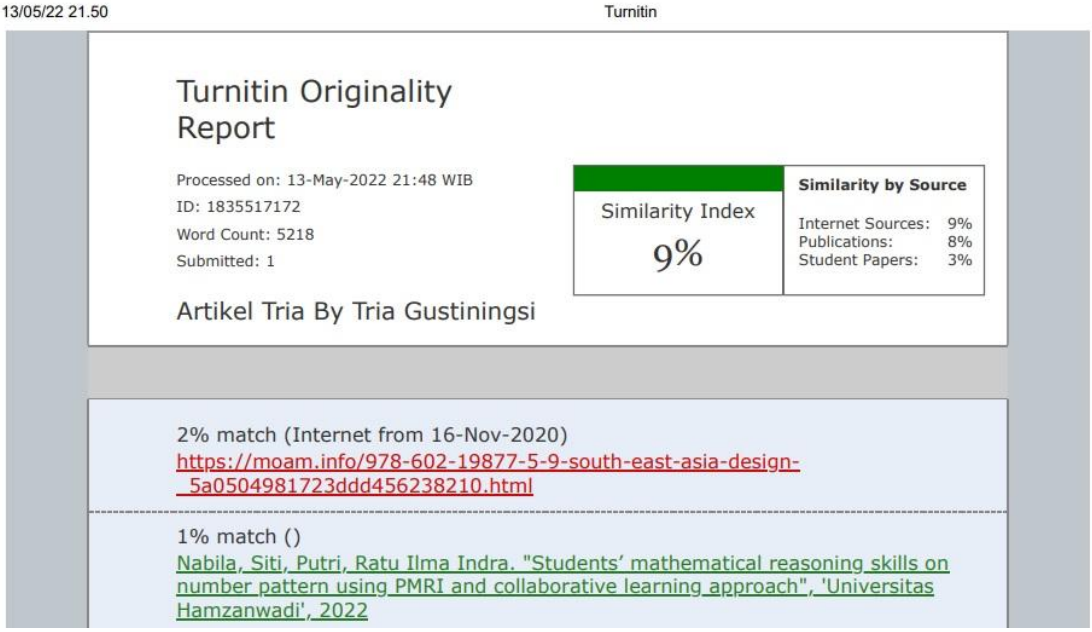

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Gambar 3. Sertifikat Proofread

Designing Student Worksheet on Relation and Function Material for Mathematics Learning: Jumping Task

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Abstract: Higher Order Thinking Skills (HOTS) are very important for students. One of the ways to improve students' HOTS is by using jumping tasks. This study aims to produce a jumping task in the form of a student worksheet which is valid and practical. Design research in the form of development studies was chosen in this study which consist of preliminary stage and prototyping stage. In the preliminary stage, preparations were made in the development of the jumping task. Then, at the prototyping stage a formative evaluation process was carried out, comprising self-evaluation, expert-review, one-to-one, small-group, and field-test. Data were collected by walk through, test, questionnaire, and interview. Data were analyzed descriptively. Student worksheet is declared valid in terms of content, construct, and language. The student worksheet is in accordance with the HOTS level in the taxonomy of Bloom and the PISA framework so that it meets the jumping task criteria. Student worksheet is valid constructively. It was found that the student worksheet was in accordance with the curriculum and the material for eight grade. The student worksheet was in accordance with the General Guidelines for Indonesian Spelling (PUEBI) and did not cause multiple interpretations. The student worksheet was also stated to be practical. Students understand the instructions or questions in the student worksheet and it can be used by students. The results of this study show that the student worksheet is valid and practical, and it can improve students' HOTS.

Keywords: HOTS, Jumping Task, Student Worksheet

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INTRODUCTION

Creativity, critical thinking, communication, and collaboration (4C) or often referred to as higher order thinking skills (HOTS) are needed by student in the 21st century (Kemdikbud, 2017; Putri, 2018; Hwang, et al., 2017). Educators, researchers, and various parties state that HOTS is very important for everyone (Bakry & Bakar, 2015; Abosalem 2016; Tambunan & Naibaho, 2019; Elfeky 2019; Lu, 2021: Gustiningsi & Somakim, 2021: Utari & Gustiningsi, 2021 : Gustiningsi & Utari, 2021).

In Bloom's taxonomy, HOTS is at a high level, which consist of analyzing, evaluating, and creating (C4, C5, and C6) (Efendi, 2017). In the Program for International Student Assessment (PISA), there are questions at level 4,5,6 (Setiawan, Dafik, & Lestari, 2014), but the PISA results show that Indonesian students' mathematical literacy skills are still low (OECD, 2019). In 2018, in the field of mathematics, Indonesia was ranked 72 out of 78 countries (OECD, 2019). Likewise in Trends in International Mathematics and Science Study (TIMSS), in 2016 Indonesia was ranked 44th out of 49 countries (Utomo, 2021). Previous research analyzed students' HOTS abilities, including students' critical thinking skills (Gustiningsi, 2015), students' ability to solve HOTS problems (Abdullah, et al, 2015), and showed that students' HOTS abilities were still low.

HOTS ability can be improve through learning in class. Bakri and Bakar (2015) stated that students abilities can be developed through activities and mathematics learning. Teachers must pay attention to students so that they can develop students' HOTS abilities (Purnomo, et al., 2021; Pasani & Suryaningsih, 2021).

One of methods that can be done to develop students' HOTS abilities is designing student worksheets to be used in class. Previous research shows that student worksheet is able to improve students' abilities such as students' concept understanding (Nursyahidah, Putri, & Somakim, 2013), students' problem solving abilities (Fitriati & Novita, 2018) and students' creative thinking skills (Romli, Abdurrahman, & Riyadi, 2018). The student worksheet must meet the HOTS criteria. Sato stated that to improve the quality of learning, the quality of the tasks given is influential, one of the tasks given was in the form of a challenging task or called a jumping task (Saito, 2015).

Sato stated that the HOTS task was related to the jumping task applied in lesson study (Putri, 2018: Putri & Zulkardi, 2019: Hobri, 2020). Jumping task is a challenging task which requires a high level of skill (HOTS) to complete (Saito, 2015; Hobri, 2016). Jumping tasks are effective in supporting students' hots abilities (Putri, 2018), one of which is problem solving skills (Hobri, et al: 2020).

Previous research has designed jumping tasks using the PISA framework (Zulkardi & Putri, 2020; Putri & Zulkardi, 2019), with an RME approach (Sa'id, et al: 2021), and based on an open-ended questions (Ummah, et al: 2021). Meanwhile, this study designed the jumping task in the form of a student worksheet using the PISA framework and adjusted the worksheet to the HOTS level in the Bloom's taxonomy. This study aims to produce a valid and practical jumping task-based student worksheet.

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RESEARCH METHOD

Design research in the form of development studies was chosen in this study (Bakker, 2019). The research subjects were 20 eight graders. The stages carried out are the preliminary stage and the prototyping stage (Tessmer, 1993; Zulkardi, 2002; Akker, et al., 2013) as shown in Figure 1.

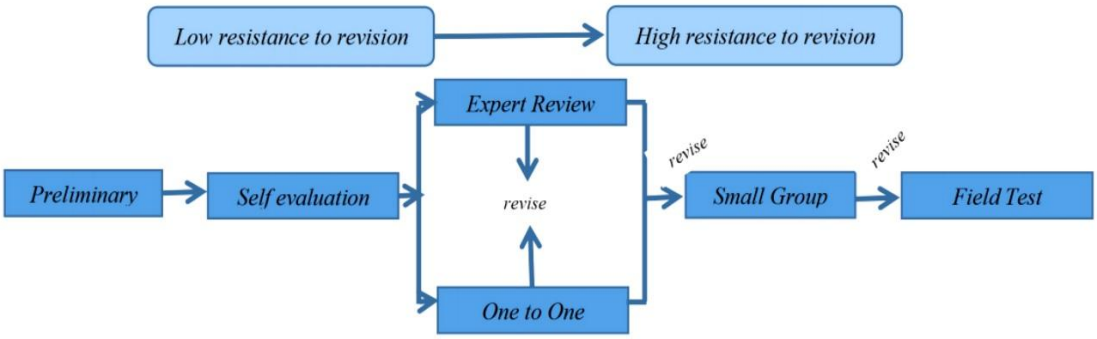

Figure 1: Prototyping Flow (Tessmer, 1993; Zulkardi, 2002; Akker,dkk., 2013)

In the preliminary stage, preparations were made to develop a jumping task in the form of a student worksheet, including analyzing eight graders' materials, analyzing research subjects, and analyzing HOTS levels in the taxonomy of Bloom, and analyzing levels in the PISA framework. Furthermore, the prototyping stage starts from the first stage, namely self-evaluation. In the self-evaluation stage, student worksheets were created and self-evaluated (prototype I). The second stage was the stage of expert review and one-to-one. In the expert-review stage, prototype I was validated by experts to see the validity of the student worksheet in terms of content, construct, and language. In the one-to-one stage, prototype I was tested on 2 students who were not research subjects to see the usability of the student worksheet, seen from student answers and student comments in interviews while working on the student worksheet and in the questionnaire after completing on the student worksheet. Then, prototype I was analyzed and revised according to suggestions from experts and according to students' comments and answers. The revised student worksheet is called prototype II. Then, prototype II was tested in the small-group stage on 5 students who were not research subjects. The small-group stage was also aimed to see the practicality of the student worksheet based on the answers and comments of students during and after completing on the student worksheet. Furthermore, the student worksheet that had been tested was analyzed and revised, hereinafter referred to as prototype III. Furthermore, prototype III was tested at the field-test stage to 20 students who were research subjects.

Data were collected through walk-through, questionnaires, and tests. The walk-through was used at the expert-review stage to ask for advice and comments from the expert, while tests, questionnaires, and interviews were used at the one-to-one, small group, and field test stages. The test was used to see the usability of the developed student worksheet (prototype) and to see the students' way of thinking, while the questionnaire and interviews were used to find out

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comments, constraints, and difficulties, and explore students' ways of thinking when completing the student worksheet. The walk-through was analyzed descriptively. Comments and suggestions from experts were described and used as materials for revising prototype I. The tests were analyzed based on the scoring rubric. Interviews and questionnaires were analyzed descriptively, then used as supporting information in the development process. The student worksheet is said to be valid in terms of content and construct seen at the expert review stage. The student worksheet is said to be valid in terms of content if it is in accordance with the HOTS level in the Bloom's taxonomy and PISA framework and is valid in terms of constructs if it is in accordance with the curriculum. Student worksheet is said to be practical if it can be understood by students, can be completed, does not cause multiple interpretations, and students are interested in doing it.

RESULT AND DISCUSSION

Result

The student worksheet had been developed in two stages, namely preliminary and prototyping. The preliminary stage was carried out by analyzing the curriculum, determining the material, analyzing HOTS criteria in Bloom's taxonomy, and analyzing HOTS criteria in PISA framework. A description of the HOTS levels in Bloom's taxonomy and the PISA framework is provided in Table 1.

Level	Bloom's Taxonomy	PISA Framework
Level 4	Analysis: The ability to break down information into pieces of information and detect the relationship of information to one another and to the overall structure and purpose. (Anderson and Krathwohl, 2001; McNeil, 2011; Widana, 2017)	Students can model concrete situations, make assumptions, choose and integrate different interpretations, relate information they have and give arguments or communicate them (OECD, 2018).
Level 5	Evaluation: Make judgments or decisions based on criteria and standards (Anderson and Krathwohl, 2001; McNeil, 2011; Widana, 2017)	Students can develop models for complex situations, identify constraints and determine assumptions, select, compare, and evaluate appropriate problem solving strategies, formulate and communicate their interpretations and reasons (OECD, 2018).
Level 6	Create:	Students can conceptualize, generalize, and utilize information based on

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Level	Bloom's Taxonomy	PISA Framework
	Putting elements together to form a new shape (Anderson and Krathwohl, 2001; McNeil, 2011; Widana, 2017)	investigation and modeling of complex problem situations, apply mathematical insights and understanding to develop new approaches and strategies, reflect and formulate as well as communicate appropriately actions and reflections on their findings (OECD, 2018).

Table 1: Cognitive level of HOTS category in taxonomy bloom and PISA framework

As Table 1 indicates, there is a match between levels 4,5,6 in the Bloom's taxonomy and the PISA framework. Thus, it can be formulated that the HOTS level consists of the ability to analyze, evaluate, and create. Next, the prototyping stage was carried out in the self-evaluation stage. In the self-evaluation stage, student worksheets were compiled and prototype I was produced. Prototype I is presented in Figure 2.

Tersedia tarif nelpon seperti pada Gambar 1 dan Gambar 2.

Informasi Talkmania	TM Siang	TM Malam	TM Jumbo
Tarif TM	Rp2.500	Rp2.500	Rp12.500
Paket TM Yang Anda dapatkan	Paket nelpon 200 menit (Senin – Jumat) *Paket nelpon 250 menit (Sabtu – Minggu)	Paket nelpon 150 menit	Paket nelpon 150 menit per hari selama 6 hari (900 menit)
Waktu Pendaftaran	01.00-16.30 WIB	17.00-23.30 WIB	01:00 – 12:00 WIB
Waktu Pemakaian	01.00-18.00 waktu setempat	17.00-24.00 waktu setempat	01:00 – 17:00 Waktu setempat

https://ngelag.com/cara-tm-simpati-nelpon-siang-malang-murah/
Gambar 1. Tarif Nelpon Paket Talkmania

Telepon

00.00 - 16.59

Rp109/5 detik selama 60 detik, selanjutnya Rp32/5 detik selama 60 detik. Skema berulang. Tarif Hari Minggu: Rp192/10 detik selama 300 detik, selanjutnya Rp0/menit selama 600 detik. Skema berulang.

17.00 - 23.59

Rp99/5 detik selama 60 detik, selanjutnya Rp30/5 detik selama 60 detik. Skema berulang. Tarif Hari Minggu: Rp174/10 detik selama 300 detik, selanjutnya Rp0/menit selama 600 detik. Skema berulang.

https://www.telkomsel.com/tariff
Gambar 2. Tarif nelpon non paket

Pada hari senin sore jam 16.30 WIB, Ani ingin menelpon temannya sekitar 5 menit karena ada urusan yang sangat penting saat itu juga. Ani bingung apakah langsung menelpon saja dengan menggunakan tarif nelpon non paket atau mendaftar paket talkmania. Akhirnya Ani memilih mendaftar paket talkmania. Apakah keputusan Ani sudah tepat? Uraikan alasanmu.

Jika pada hari senin sore jam 16.30 WIB itu Ani memilih menelpon dengan tarif nelpon non paket, gambarkan grafik yang menunjukkan antara waktu menelpon Ani dengan harga menelpon yang harus dibayar tiap menit.

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Apakah hubungan antara waktu dengan harga nelpon non paket ini merupakan fungsi? Uraikan alasanmu.

(a)

Translated to English:

Available calling rates as shown in Figure 1 and Figure 2.

Talkmania (TM) information	TM Day	TM night	TM Double
TM Rate	Rp 2.500	Rp 2.500	Rp 12.500
TM package you get	call package 200 minutes (Monday – Friday) call package 250 minutes (Saturday – Sunday)	call package 150 minutes	Call package 150 minutes per day for 6 days
Registration time	01.00 – 16.30 West indonesian time	17.00 – 23.30 West indonesian time	01.00 – 12.00 West indonesian time
Usage Time	01.00 – 18.00 local time	17.00 – 24.00 local time	01.00 – 17.00 local time

Figure 1. Talkmania Package Call Rates

Telephone

00.00– 16.59
Rp 109/5 seconds, next Rp 32/5 seconds for 60 seconds. Repeating scheme. Rate for Sunday: Rp 192/10 seconds for 300 seconds, next Rp 0/minute for 600 seconds. Repeating scheme.

17.00 – 23.59
Rp 99/5 seconds for 60 seconds, next Rp 30/5 seconds for 60 seconds. Repeating scheme. Rate for Sunday: Rp 174/10 seconds for 300 seconds, next Rp 0/minute for 600 seconds. Repeating scheme.

Figure 2. Non-package call rates

On Monday afternoon at 16.30 West Indonesian Time , Ani wanted to call her friend for about 5 minutes because she had very important business at that time. Ani is confused whether to just call or register for a talkmania package. Finally, Ani chose to sign up for the talkmania package. Is Ani's decision right? Please describe your reason.

If on Monday afternoon at 16.30 West Indonesian Time, Ani chooses to make a call with a non-package call rate, draw a graph that shows the time between Ani's call and the price she has to pay every minute.

Is the relationship between time and the price of this non-packaged call called a function? Describe your reasons.

(b)

Figure 2: Prototype I

For the ability to analyze, the student worksheet provides a table of tariff for calling and non-package, which shows the price, registration time and usage time. This table presents information that must be analyzed by students in order to be able to answer the questions in the student

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worksheet. Then, for the ability to evaluate, the question "whether Ani's choice is right", is a stimulating question so that the students can judge or choose on the answer based on the information that has been analyzed previously. For creative skills, the question to draw a graph and the question “is the relationship between time and price a function” stimulates students to make a graph and create an argument in the form of a picture or another to answer the question. The relationship between the student worksheet and the HOTS level can be seen in Table 2.

Student Worksheet	Level Cognitif
Available calling rates as shown in Figure 1 and Figure 2.	Analysis

Talkmania (TM) information	TM Day	TM night	TM Double
TM Rate	Rp 2.500	Rp 2.500	Rp 12.500
TM package you get	call package 200 minutes (Monday – Friday) call package 250 minutes (Saturday – Sunday)	call package 150 minutes	Call package 150 minutes per day for 6 days
Registration time	01.00 – 16.30 West indonesian time	17.00 – 23.30 West indonesian time	01.00 – 12.00 West indonesian time
Usage Time	01.00 – 18.00 local time	17.00 – 24.00 local time	01.00 – 17.00 local time

Figure 1. Talkmania Package Call Rates

Telephone

00.00– 16.59
Rp 109/5 seconds, next Rp 32/5 seconds for 60 seconds. Repeating scheme. Rate for Sunday: Rp 192/10 seconds for 300 seconds, next Rp 0/minute for 600 seconds. Repeating scheme.

17.00 – 23.59
Rp 99/5 seconds for 60 seconds, next Rp 30/5 seconds for 60 seconds. Repeating scheme. Rate for Sunday: Rp 174/10 seconds for 300 seconds, next Rp 0/minute for 600 seconds. Repeating scheme.

Figure 2. Non-package call rates

On Monday afternoon at 16.30 West Indonesian Time , Ani wanted to call her friend for about 5 minutes because she had very important business at that time. Ani is confused whether to just call or register for a talkmania package. Finally, Ani chose to sign up for the talkmania package. Is Ani's decision right? Please describe your reason.	Analysis dan Evaluation
If on Monday afternoon at 16.30 West Indonesian Time, Ani chooses to make a call with a non-package call rate, draw a graph that shows the time between Ani's call and the price she has to pay every minute.	Analysis, Evaluation, and Create

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Student Worksheet	Level Cognitif
Is the relationship between time and the price of this non-packaged call called a function? Describe your reasons.	Analysis dan Evaluation

Table 2: Student worksheet relationship with HOTS level

Then, prototype I was validated by the expert at the expert review stage. The expert provided suggestions and comments consisting of: 1) Please add pictures that can attract students' attention, 2) Non-package data is simplified to 60 seconds, 3) The call package tariff table should be retyped so that it is clear, 4) It is in accordance with the HOTS level based of taxonomy bloom and PISA framework, 5) It is in accordance with curriculum and material for eight graders.

In parallel, prototype I was tested on 2 students at the one-to-one stage. The students' comments in the one-to-one stage are shown in Table 2. Based on the students' answers in the one-to-one stage, the students were confused about the non-package price and they were confused about changing the price per second on the non-package tariff.

Based on the expert- review and one-to-one stage, prototype I was analyzed and revised with the revision decision. The revised decision consist of: 1) Add pictures that can attract students' attention, 2) Non-package data simplified to 60 seconds, 3) Rate table retyped. The revised student worksheet is called prototype II, as shown in Figure 3.

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PETUNJUK KEGIATAN:

1. Diskusikan dengan kelompokmu untuk menjawab pertanyaan yang tersedia.
2. Tuliskan jawabanmu masing-masing pada tempat yang telah disediakan.

Tersedia tarif nelpon seperti yang ditampilkan Tabel 1 dan Tabel 2.

Tabel 1. Tarif Nelpon Paket Talkmania

Informasi Talkmania (TM)	TM Siang	TM Malam	TM Jumbo
Tarif TM	Rp 2.500	Rp 2.500	Rp 12.500
Paket TM yang Anda dapatkan	Paket nelpon 200 menit (senin-jumat) *paket nelpon 250 menit (sabtu-minggu)	Paket nelpon 150 menit	Paket nelpon 150 menit per hari selama 6 hari (900 menit)
Waktu Pendaftaran	01.00 - 16.30 WIB	17.00 - 23.30 WIB	01.00 - 12.00 WIB
Waktu Pemakaian	01.00 - 18.00 waktu setempat	17.00 - 24.00 waktu setempat	01.00 - 17.00 waktu setempat

Sumber: https://ngelag.com/cara-tm-simpati-nelpon-siang-malang-murah/

Tersedia juga tarif nelpon non paket.

Tabel 2. Tarif Nelpon Non Paket

Waktu	Tarif
00.00 - 16.59	Rp 1.300 setiap 60 detik (senin - sabtu) Rp 1.100 setiap 60 detik (minggu)
17.00 - 23.59	Rp 1.188 setiap 60 detik (senin - sabtu) Rp 1.100 setiap 60 detik (minggu)

Pada hari senin sore jam 16.00 WIB, Ani ingin menelpon temannya sekitar 5 menit karena ada urusan yang sangat penting saat itu juga. Ani bingung apakah langsung menelpon saja dengan menggunakan tarif nelpon non paket atau mendaftar paket talkmania. Yang mana yang sebaiknya dipilih Ani? Menelpon dengan paket talkmania atau menelpon dengan non paket? Uraikan alasanmu.

Jika pada hari senin sore jam 16.00 WIB itu Ani memilih menelpon dengan tarif nelpon non paket, gambarkan grafik yang menunjukkan antara waktu menelpon Ani dengan harga menelpon yang harus dibayar tiap menit.

Apakah hubungan antara waktu dengan harga nelpon non paket ini merupakan fungsi? Uraikan alasanmu.

(a)

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Translated to English:

ACTIVITY INSTRUCTIONS:
1. Discuss with your group to answer the questions provided.
2. Write your answers in the space provided.

Call rates are available as shown in Table 1 and Table 2.

Table 1. Talkmania Package Call Rates

Talkmania (TM) information	TM Day	TM night	TM Double
TM Rate	Rp 2.500	Rp 2.500	Rp 12.500
TM package you get	call package 200 minutes (Monday – Friday) call package 250 minutes (Saturday – Sunday)	call package 150 minutes	Call package 150 minutes per day for 6 days
Registration time	01.00 – 16.30 West indonesian time	17.00 – 23.30 West indonesian time	01.00 – 12.00 West indonesian time
Usage Time	01.00 – 18.00 local time	17.00 – 24.00 local time	01.00 – 17.00 local time

Source: https://ngelag.com/cara-tm-simpati-nelpon-siang-malang-murah/

Non-package call rates are also available.

Table 2. Non-Package Call Rates

Time	Rate
00.00 - 16.59	Rp 1.300 every 60 seconds (Monday - saturday) Rp 1.100 every 60 seconds (sunday)
17.00 - 23.59	Rp 1.188 every 60 seconds (Monday - saturday) Rp 1.100 every 60 seconds (sunday)

On Monday afternoon at 16.00 West Indonesian Time , Ani wanted to call her friend for about 5 minutes because she had very important business at that time. Ani is confused whether to just call or register for a talkmania package. Finally, Ani chose to sign up for the talkmania package. Is Ani's decision right? Please describe your reason.

If on Monday afternoon at 16.00 West Indonesian Time, Ani chooses to make a call with a non-package call rate, draw a graph that shows the time between Ani's call and the price she has to pay every minute.

Is the relationship between time and the price of this non-packaged call called a function? Describe your reasons.

(b)

Figure 3: Protoype II

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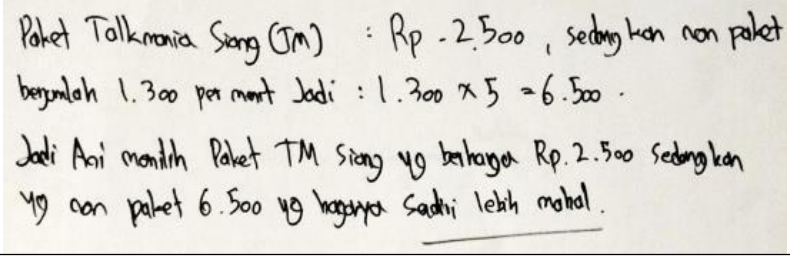
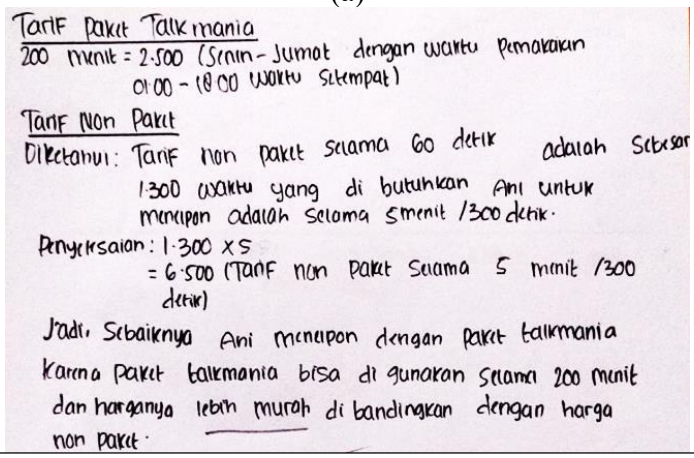
Prototype II was tested on students in the small group stage to four students. In the small group stage, it can be seen from the students' answers that none of the students were confused about the questions on the student worksheet and students stated that they needed a high level of thought to determine the answers on the student worksheet. This is a consideration for the researchers not to revise prototype II because it can practically be done by students and requires high thinking. Then, the student worksheet was tested in the field test stage.

In the field test stage, there were 20 students who were the subjects for the student worksheet test. The students' answers to the first question regarding Ani's decision to choose the talkmania package are as follows.


Paket Talkmania Siang (TM) : Rp. 2.500, sedangkan non paket berjumlah 1.300 per menit Jadi : 1.300 x 5 = 6.500.
Jadi Ani memilih Paket TM Siang yg berharga Rp. 2.500 sedangkan yg non paket 6.500 yg harganya sadhi lebih mahal.

Translated to English:
Talkmania Day package: IDR 2.500, while the non-package is IDR 1300 per minute, So 1.300 x 5 = 6.500. So, Ani bought the TM Day package for IDR 2500, while the non-package is IDR 6.500 which more expensive.

(a)


Tarif Paket Talkmania
200 menit = 2.500 (Senin - Jumat dengan waktu pemakaian 01.00 - 18.00 waktu setempat)
Tarif Non Paket
Diketahui: Tarif non paket selama 60 detik adalah sebesar 1.300 waktu yang di butuhkan Ani untuk menelpon adalah selama 5menit /300 detik.
Penyelesaian: 1.300 x 5
= 6.500 (Tarif non paket selama 5 menit /300 detik)
Jadi, Sebaiknya Ani menelpon dengan paket talkmania karena paket talkmania bisa di gunakan selama 200 menit dan harganya lebih murah di bandingkan dengan harga non paket.

Translated to English:
Talkmania package rates
200 minutes = 2.500 (Monday – Friday with usage time are 01.00 – 18.00 local time)

Non-package rates
Known: non-package rates for 60 seconds is 1300, the time which Ani needed to call is 5 minutes or 300 seconds.
Solusion:

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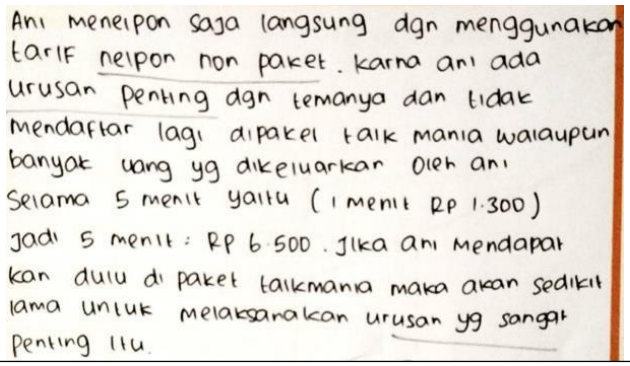
1.300 x 5 = 6.500 (non-package rates for 5 minutes or 300 seconds). So it's better if Ani call with the talkamnia package because the talkmania package can be used for 200 minutes and the price is cheaper than the non-package price.

(b)

Figure 4: Students' answers to questions about Ani's decision

As Figure 4 shows, the students analyzed package and non-package prices and then compared them. They evaluated it by calculating the non-package price for 5 minutes and it can be seen that the non-package price is more expensive than the price for calling with a talkmania package. Then, the students can decide that Ani's choice is right.

In addition, there were students who answered differently from the answers in Figure 4, as shown in Figure 5 below.



Translated to English:

Ani just called directly using a non-package call rate because Ani had important business with her friend and didn't register for the talkmania package even though Ani spent a lot of money for 5 minutes (1 minute IDR 1.300) so 5 minutes was IDR 6.500. If Ani registers in the talkmania package first, it will take a longer time to carry out that very important business.

Figure 5: Different Students' Answers to the First Question

Based on Figure 5, students answered that Ani should call at a non-package rate because it would save time. In Figure 5, it can be seen the students analyzed the price of package and non-package so that they know the cheaper price for calling is making a call with a talkmania package, it is also seen that the students evaluated Ani's decision by calculating the cost of calling for 5 minutes, but they focused on the sentence "There is an important business right away" which according to the student in Figure 5 that the matter should not be postponed, so students answered the call directly with non-package only with the risk of being more expensive but saving time.

Then, for the second question regarding graphics. Students' answers can be seen in Figure 6.

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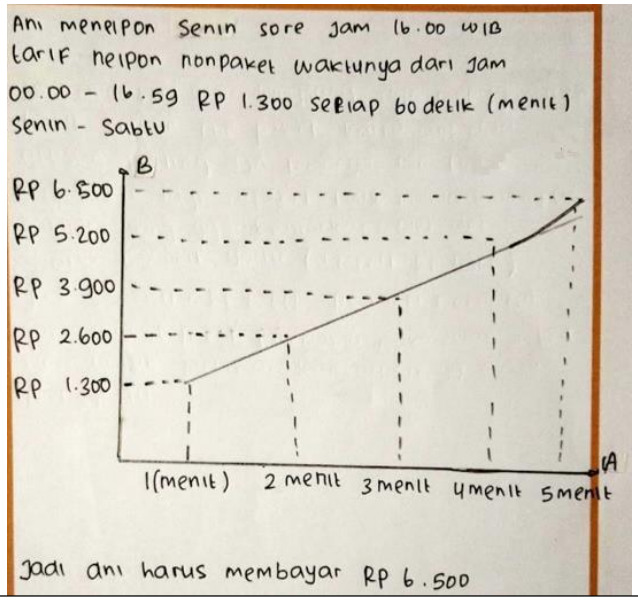
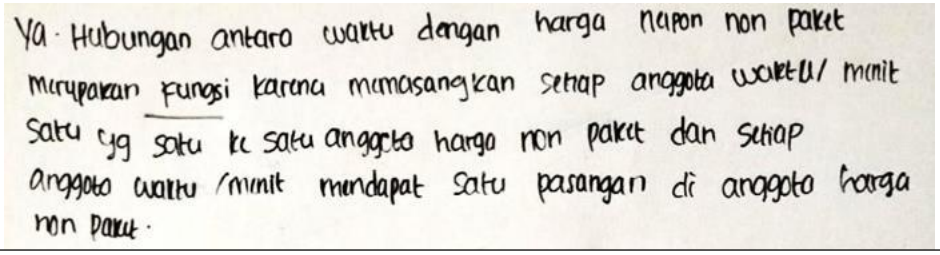


Translated to English:
Ani call at Monday afternoon at 16.00 West Indonesian Time, non-package call rates from 00.00 – 16.59 is IDR 1.300 every 60 seconds.

Figure 6: Student Answers for the Second Question

Based on Figure 6, it can be seen that the students can draw and describe the graph that shows the relationship between the costs incurred when calling with non-package rates and with the length of time calling.

Next is the question of whether the relationship between time and the price of non-packaged calls is a function. The students' answers are shown in Figure 7.



Translate in English:
Yes, the relationship between time and non-package prices is a function because each time member pairs one at a time to a non-packaged price member, the time member gets one pair to a non-packaged price member.

(a)

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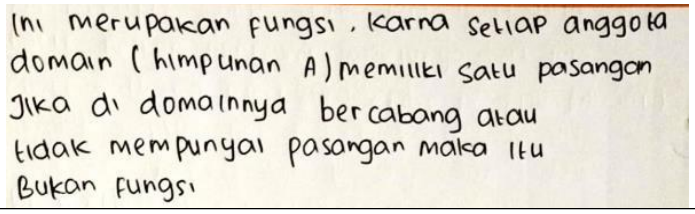

Translate in English:
This is a function because each member of the domain (set A) has one pair. If the domains are forked or have no pairs then it's not a function

(b)

Figure 7: Student Answer for Third Question

Based on Figure 7, the students can determine that the relationship between call time and price is a function. In Figure 7 (b), the students explained the comparison between functions and non-functions. From Figure 7 (b), it can be seen that the students can analyze and evaluate to decide the right answer.

Discussion

Akker, et al. (2013) stated that a product is said to be valid if the product developed is based on knowledge or science (content validity) and if the product is consistent with each other or is logical to design (construct validity). Based on the research results, the expert stated that the student worksheet was in accordance with the HOTS level based on the Bloom's taxonomy and the PISA framework. It can be seen in table 2 that the information and questions in the student worksheet are adjusted to the HOTS level. This shows that the student worksheet is valid in terms of content. Then, the expert stated that the student worksheet was in accordance with the 2013 curriculum and that the material chosen was in accordance with the material in class VIII. This shows that the student worksheet is valid in terms of constructs.

Student worksheets are said to be practical if they can be used and are easy to use (Akker, et al., 2013). Based on the development of the prototyping stage from one-to-one to field-tests, students' answers in Figures 4 to 7 show that they can work on the given student worksheet and are not confused by the questions or information in the student worksheet. This shows that the designed student worksheet is practical.

Based on Figures 4(a) and 4(b), the students can relate the information in the table and compare the price of calling with talkmania packages and non-package prices. Then, the students make decisions about which package should be chosen. As Figures 4(a) and 4(b) indicate, the students choose the talkmania package as calling with the talkmania package is cheaper than the non-packaged one. However, a student's answer in Figure 5 shows that students prefer to call with non-package with the reason that the process is faster, they pay attention to the sentence "there is an important business right away". The students' answers in Figure 3 and Figure 4 correspond to

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the description of their ability to analyze and evaluate (Anderson and Krathwohl, 2001; McNeil, 2011; Widana, 2017). Judging from the level in the PISA framework, the students' answers in Figure 4 and Figure 5 show that they can make models from real situations, make assumptions, are able to interpret tables or available information and relate the information provided in tables and questions in the student worksheet to determine answers. right. This includes capabilities at level 4 in the PISA framework (OECD, 2018). Then, in Figure 4 and Figure 5 students are also able to determine which calling package decision should be chosen by including their respective arguments. This includes capabilities at level 5 of the PISA framework.

Based on Figure 6, the students can draw a graph that shows the relationship between calling time and costs incurred. To draw a graph, students analyzed the available information about prices and calling times consisting of days and hours. They evaluated the relationship between calling time and the costs incurred for calling with non-package. Then, the students create a new graph. The student's answer in Figure 6 corresponds to the description of the ability to analyze, evaluate, and create (Anderson and Krathwohl, 2001; McNeil, 2011; Widana, 2017). Based on the level in the PISA framework, the students' ability to analyze to draw graphs is included in level 6 because it is seen that the students can create concepts between the x-axis and y-axis, utilize information, and apply insights to develop new strategies (OECD, 2018). It can be seen in Figure 6 that the students present graphs and can read clear information from the displayed graphs.

In Figures 7 (a) and 7 (b), students analyzed answers by paying attention to the definition of a function and relating it to the condition of the relationship between non-packet calling time and the cost. Then, the students evaluated it by comparing it with the definition of a non-function (Figure 7(b)) . The students' answers in Figure 7 correspond to the description of the ability to analyze and evaluate (Anderson and Krathwohl, 2001; McNeil, 2011; Widana, 2017). Based on the PISA framework, the students meet ability levels 4 and 5, because it appears that students can model real situations, determine assumptions, interpret the relationship between calling time and cost, relate existing information, and to decide that the relationship between calling time and non-package calling costs is a function with the correct arguments.

Based on students' answers, it can be seen that the designed student worksheet is able to improve students' HOTS abilities. This is in accordance with the jumping task criteria, namely the task given is challenging and requires the HOTS ability to complete it (Saito, 2015; Hobri, 2016).

CONCLUSION

Based on the student worksheet development, a valid and practical student worksheet has been produced. The student worksheet is declared valid in terms of content because it is in accordance with level HOTS in taxonomy bloom and PISA framework. The student worksheet is valid in terms of constructs because it is in accordance with the material contained in the 2013

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curriculum for eight graders. The student worksheet is also practical which shows that it can be used by students, students understand the purpose of activities or problems in the student worksheet, and support student ability namely HOTS.

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Designing Student Worksheet on Relation and Function Material for Mathematics Learning: Jumping Task Tria Gustiningsi1, Ratu Ilma Indra Putri1, Zulkardi1, Diah Kartika Sari1, Leni Marlina1, Dewi Rawani1, Arika

Sari1, Zahara Luthfiya Azmi1, Delia Septimiranti1 1Universitas Sriwijaya, Indonesia triagustiningsi08@gmail.com, ratuilma@unsri.ac.id, zulkardi@unsri.ac.id, diah_kartika_sari@fkip.unsri.ac.id, leni_marlina@fkip.unsri.ac.id, dewirawani@yahoo.com, arikasari1998@gmail.com, septimirantidelia09@gmail.com, Zaharaedhiza20@gmail.com Abstract: Higher Order Thinking Skills (HOTS) are very important for all students. One of the ways to raise students' HOTS is through jumping tasks. This study aims to produce a jumping task in student worksheet form which valid and practical. The research was conducted using a design research type of development studies which consist of a preliminary stage and a prototyping stage. In the preliminary stage, preparations were made in the preparation of the jumping task, then at the prototyping stage a formative evaluation process was carried out which consist of self-evaluation, expert-review, one-to- one, small-group, and field-test. Data were collected by walk through, test, questionnaire, and interview. Data were analyzed qualitatively. Student worksheet is declared valid in terms of content, construct, and language. Valid in content found that student worksheet was in accordance with the HOTS level in the taxonomy bloom and the PISA framework so that it met the jumping task criteria. Student worksheet is valid constructively, it was found that the student worksheet was in accordance with the curriculum and in accordance with the material for eight grade. Student worksheet is valid in language, it was found that the student worksheet was in accordance with the General Guidelines for Indonesian Spelling (PUEBI) and did not cause multiple interpretations. Student worksheets are also stated to be practical, students understand the instructions or questions in the student worksheets and can be used by students. The result in this study show that student worksheet was valid, practical, and can support students' HOTS abilities. Keywords: HOTS, Jumping Task, Student Worksheet INTRODUCTION Creativity, critical thinking, communication, and collaboration (4C) or often referred to as higher order thinking skills (HOTS) are skills that are needed in the 21st century (Kemdikbud, 2017; Putri, 2018; Hwang, et al., 2017). Educators, researchers, and various parties state that HOTS is very important for everyone (Bakry & Bakar, 2015; Abosalem 2016; Tambunan & Naibaho, 2019; Elfeky 2019; Lu, 2021: Gustiningsi & Somakim, 2021: Utari & Gustiningsi, 2021 : Gustiningsi & Utari, 2021). In bloom taxonomy, HOTS is at a high level, namely analyzing, evaluating, and creating (C4, C5, and C6) (Efendi, 2017). In the Program for International Student Assessment (PISA) there are also questions that are at level 4,5,6 (Setiawan, Dafik, & Lestari, 2014), but the PISA results show that Indonesian students' mathematical literacy skills are still low (OECD, 2019). In 2018, in the field of mathematics, Indonesia was ranked 72 out of 78 countries (OECD, 2019). Likewise in Trends in International Mathematics and Science Study (TIMSS), in 2016 Indonesia was ranked 44th out of 49 countries (Utomo, 2021). Previous research analyzed students' HOTS abilities, including students' critical thinking skills (Gustiningsi, 2015), students' ability to solve HOTS problems (Abdullah, et al, 2015), and showed that students' HOTS abilities were still low. HOTS ability can be trained by learning that is accustomed in class. Bakri & Bakar (2015) stated that students' abilities can be developed through activities and learning mathematics. Teachers must pay attention to students so that they can develop students' HOTS abilities (Purnomo, et al., 2021; Pasani & Suryaningsih, 2021). One thing that can be done to develop students' HOTS abilities is to design student worksheets to be applied in class. Based on previous research, the designed student worksheet is able to improve students abilities such as students' concept understanding (Nursyahidah, Putri, & Somakim, 2013), students' problem solving abilities (Fitriati & Novita, 2018) and is also able to develop students' creative thinking skills (Romli, Abdurrahman, & Riyadi, 2018). The developed student worksheet must meet the HOTS criteria. Sato stated that to improve the quality of learning, the quality of the tasks given was very influential, one of the tasks given was in the form of a challenging task or called a jumping task (Saito, 2015). Sato stated that the HOTS task was

related to the jumping task applied in lesson study (Putri, 2018: Putri & Zulkardi, 2019: Hobri, 2020). Jumping task is a challenging task and requires a high level of skill (HOTS) to complete (Saito, 2015; Hobri, 2016). Jumping tasks are effective in supporting students' hots abilities (Putri, 2018), one of which is problem solving skills (Hobri, et al: 2020). Previous research has designed jumping tasks using the PISA framework (Zulkardi & Putri, 2020; Putri & Zulkardi, 2019), with an RME approach (Sa'id, et al: 2021), based on an open ended (Ummah, et al: 2021). Meanwhile, this study designed the jumping task in the form of a student worksheet using the PISA framework and adjusted to the HOTS level in the bloom taxonomy. This study aims to produce a valid and practical jumping task-based student worksheet. RESEARCH METHOD The method in this study is a design research method with the type of development studies (Bakker, 2019). The research subjects were 20 eight graders. The stages carried out are the preliminary stage and the prototyping stage (Tessmer, 1993; Zulkardi, 2002; Akker, et al., 2013) as shown in Figure 1. Figure 1. Prototyping Flow (Tessmer, 1993; Zulkardi, 2002; Akker,dkk., 2013) In the preliminary stage, preparations were made to develop a jumping task in the form of a student worksheet, including analyzing eight graders material, analyzing research subjects, and analyzing HOTS levels in taxonomy blooms, and analyzing levels in the PISA framework. Furthermore, the prototyping stage starts from the first stage, namely self-evaluation. In the self- evaluation stage, student worksheets are created and evaluated by themselves (prototype I). The second stage is the stage of expert review and one-to-one. At the expert-review stage, prototype I was validated by experts to see the validity of the student worksheet in terms of content, construct, and language. In the one-to-one stage, prototype I was tested on 2 students who were not research subjects to see the usability of the student worksheet that was done, seen from student answers and student comments in interviews while working on the student worksheet and in the questionnaire after working on the student worksheet. Then, prototype I was analyzed and revised according to suggestions from experts and according to students' comments and answers. The revised student worksheet is called prototype II. Then, prototype II was tested at the small-group stage on 5 students who were not research subjects. The small-group stage is also to see the practicality of the student worksheet as seen from the answers and comments of students during and after working on the student worksheet. Furthermore, the student worksheet that has been tested is analyzed and revised and hereinafter referred to as prototype III. Furthermore, prototype III was tested at the field-test stage to 20 students who were research subjects. Data were collected with walk-through, questionnaires, and tests. The walk-through is used at the expert-review stage to ask for advice and comments from the expert, while tests, questionnaires, and interviews are used at the one-to-one, small group, and field test stages. The test was used to see the usability of the developed student worksheet (prototype) and to see the students' way of thinking, while the questionnaire and interviews were used to find out comments, constraints, difficulties, and explore students' ways of thinking when working on the student worksheet. The walk-through was analyzed descriptively, comments and suggestions from experts were described and used as material for revising prototype I. The tests were analyzed based on the scoring rubric. Interviews and questionnaires were analyzed descriptively, then used as supporting information in the development process. The student worksheet is said to be valid in terms of content and construct seen at the expert review stage. The student worksheet is said to be valid in terms of content if the developed student worksheet is in accordance with the HOTS level in the bloom taxonomy and PISA framework and is valid in terms of constructs if it is in accordance with the curriculum. Student worksheet is said to be practical if it can be understood by students, can be done, does not cause multiple interpretations, and students are interested in doing it. RESULT AND DISCUSSION Result The student worksheet has been developed in two stages, namely preliminary

and prototyping. The preliminary stage is carried out by analyzing the curriculum, determining the material, analyzing HOTS criteria in taxonomy bloom, and analyzing HOTS criteria in PISA framework. A description of the HOTS levels in the taxonomy bloom and the PISA framework is provided in table 1. Level Taxonomy Bloom PISA Framework Level 4 Level 5 Level 6 Analysis: The ability to break down information into pieces of information and detect the relationship of information to one another and to the overall structure and purpose. (Anderson and Krathwohl, 2001; McNeil, 2011; Widana, 2017) Evaluation: Make judgments or decisions based on criteria and standards (Anderson and Krathwohl, 2001; McNeil, 2011; Widana, 2017) Create: Putting elements together to form a new shape (Anderson and Krathwohl, 2001; McNeil, 2011; Widana, 2017) Students can model concrete situations, make assumptions, can choose and integrate different interpretations, relate information they have and give arguments or communicate them (OECD, 2018). Students can develop models for complex situations, identify constraints and determine assumptions, can select, compare, evaluate appropriate problem solving strategies, can formulate and communicate their interpretations and reasons (OECD, 2018). Students can conceptualize, generalize, and utilize information based on investigation and modeling of complex problem situations, can apply mathematical insights and understanding to develop new approaches and strategies, students can reflect and formulate and communicate appropriately actions and reflections on their findings (OECD, 2018). Table 1. Cognitive level of HOTS category in taxonomy bloom and PISA framework Seen from table 1, there is a match between levels 4,5,6 in the bloom taxonomy and in the PISA framework so that it can be formulated that the HOTS level consists of the ability to analyze, evaluate, and create. Next, the prototyping stage is carried out from the self-evaluation stage. In the self-evaluation stage, student worksheets are compiled and produce prototype I. The prototype I is available in Figure 2. (a) Translate in English: (b) Figure 2. Prototype I Protoype I is designed according to the HOTS level as shown in table 1. For the ability to analyze, the student worksheet provides a table of tariff for calling and non-package packages, which shows the price, registration time and usage time. This table is in the form of information that must be analyzed by students in order to be able to answer the questions in the student worksheet. Then, for the ability to evaluate, the question "whether Ani's choice is right", is a stimulating question so that students can judge or decide on the answer based on the information that has been analyzed previously. For creative skills, the question to draw a graph and the question "is the relationship between time and price a function" stimulates students to make a graph and create an argument in the form of a picture or another to answer the question. The relationship between the student worksheet and the HOTS level can be seen in table 2. Student Worksheet Level Cognitif Student Worksheet Level Cognitif Table 2. Student worksheet relationship with HOTS level Analysis Analysis dan Evaluation Analysis, Evaluation, and Create Analysis dan Evaluation Then, the prototype I was validated to the expert at the expert review stage. The expert gives suggestions and comments which consist of: 1) Please add pictures that can attract students' attention, 2) Non-package data is simplified to 60 seconds, 3) The call package tariff table should be retyped so that it is clear, 4) It is in accordance with the HOTS level based of taxonomy bloom and PISA framework, 5) It is in accordance with curriculum and material for eight graders. In parallel, the prototype I was tested on 2 students at the one to one stage. Student comments at the one to one stage are shown in table 2. Based on students' answers in the one to one stage students are confused about the non-package price and students are confused about changing the price per second on the non-package tariff. Based on expert review and one to one, prototype I was analyzed and revised with the revision decision. The revised decision consist of: 1) Add pictures that can attract students' attention, 2) Non-package data simplified to 60 seconds, 3) Rate table retyped. The revised student worksheet is called prototype II, as shown in Figure 3. (a) Translate in English: (b) Figure

3. Protoype I Prototype II was tested on students at the small group stage to four students. In the small group stage, it can be seen from the students' answers that none of the students were confused about the questions on the student worksheet and students stated that they needed a high level of thought to determine the answers on the student worksheet. This is a consideration for researchers not to revise prototype II because it can practically be done by students and requires high thinking. Then the student worksheet was tested to the field test stage. In the field test stage, there were 20 students who were the subjects for the student worksheet test. Following are the students' answers to the first question regarding Ani's decision to choose the talkmania package. Translate in English: Talkmania Day package: IDR 2.500, while the non-package is IDR 1300 per minute, So 1.300 x 5 = 6.500. So, Ani bought the TM Day package for IDR 2500, while the non-package is IDR 6.500 which more expensive. (a) Translate in English: Talkmania package rates 200 minutes = 2.500 (Monday – Friday with usage time are 01.00 – 18.00 local time) Non-package rates Known: non-package rates for 60 seconds is 1300, the time which Ani needed to call is 5 minutes or 300 seconds. Solusion: 1.300 x 5 = 6.500 (non-package rates for 5 minutes or 300 seconds). So it's better if Ani call with the talkamnia package because the talkmania package can be used for 200 minutes and the price is cheaper than the non-package price. (b) Figure 4. Students' answers to questions about Ani's decision Seen from Figure 4, students analyze package and non-package prices and then compare them. Students evaluate it by calculating the non-package price for 5 minutes and it can be seen that the non-package price is more expensive than the price for calling with a talkmania package. Then students can decide that Ani's choice is right. In addition, there were students who answered differently from the answers in Figure 4, as shown in Figure 5 below. Translate in English: Ani just called directly using a non-package call rate because Ani had important business with her friend and didn't register for the talkmania package even though Ani spent a lot of money for 5 minutes (1 minute IDR 1.300) so 5 minutes was IDR 6.500. If Ani registers in the talkmania package first, it will take a longer time to carry out that very important business. Figure 5. Different Students' Answers to the First Question Based on Figure 5, students answered that Ani should call at a non-package rate because it would save time. In Figure 5, it can be seen that students analyze the price of package and non-package so that students know the cheaper price for calling is if calling with a talkmania package, it is also seen that students evaluate Ani's decision by calculating the cost of calling for 5 minutes, but students focus on the sentence "There is an important business right away" which according to the student in Figure 5 that the matter should not be postponed, so students answered the call directly with non-package only with the risk of being more expensive but saving time. Then, for the second question regarding graphics. Students' answers can be seen in Figure 6. Translate in English: Ani call at Monday afternoon at 16.00 West Indonesian Time, non-package call rates from 00.00 – 16.59 is IDR 1.300 every 60 seconds. Figure 6. Student Answers for the Second Question Based on Figure 6, it can be seen that students can draw and describe the graph that shows the relationship between the costs incurred when calling with non-package rates and with the length of time calling. Next is the question of whether the relationship between time and the price of non-packaged calls is a function. The students' answers are shown in Figure 7. Translate in English: Yes, the relationship between time and non-package prices is a function because each time member pairs one at a time to a non-packaged price member, the time member gets one pair to a non-packaged price member. (a) Translate in English: This is a function because each member of the domain (set A) has one pair. If the domains are forked or have no pairs then it's not a function (b) Figure 7. Student Answer for Third Question Based on Figure 7, students can determine that the relationship between call time and price is a function, in Figure 7 (b) students explain the comparison between functions and non-functions. From Figure 7 (b) it can be seen that students can analyze and evaluate to decide the right

answer. Discussion Akker, et al. (2013) stated that a product is said to be valid if the product developed is based on knowledge or science (content validity) and if the product is consistent with each other or is logical to design (construct validity). Based on the research results, the expert stated that the student worksheet was in accordance with the HOTS level based on the bloom taxonomy and the PISA framework. It can be seen in table 2 that the information and questions in the student worksheet are adjusted to the HOTS level. This shows that the student worksheet is valid in terms of content. Then, the expert stated that the student worksheet was in accordance with the 2013 curriculum and the material chosen was in accordance with the material in class VIII. This shows that the student worksheet is valid in terms of constructs. Student worksheets are said to be practical if they can be used and are easy to use (Akker, et al., 2013). Based on the development of the prototyping stage from one-to-one to field tests, it can be seen that students' answers in Figures 4 to 7 show that students can work on the given student worksheet and are not confused by the questions or information in the student worksheet. This shows that the designed student worksheet is practical. Based on Figures 4(a) and 4(b), students can relate the information in the table and compare the price of calling with talkmania packages and non-package prices, then students make decisions about which package should be chosen. Figures 4(a) and 4(b) students choose the talkmania package on the grounds that calling with the talkmania package is cheaper than the non-packaged one. However, the student's answer in Figure 5 shows that students prefer to call with non- package with the reason that the process is faster, students pay attention to the sentence "there is an important business right away". Students' answers in Figure 3 and Figure 4 correspond to the description of their ability to analyze and evaluate (Anderson and Krathwohl, 2001; McNeil, 2011; Widana, 2017). Judging from the level in the PISA framework, students' answers in Figure 4 and Figure 5 show that students can make models from real situations, make assumptions, are able to interpret tables or available information and relate the information provided in tables and questions in the student worksheet to determine answers. right. This includes capabilities at level 4 in the PISA framework (OECD, 2018). Then, in Figure 4 and Figure 5 students are also able to determine which calling package decision should be chosen by including their respective arguments. This includes capabilities at level 5 of the PISA framework. Based on Figure 6, students can draw a graph that shows the relationship between calling time and costs incurred. To draw a graph, students have analyzed the available information about prices, calling times consisting of days and hours, and evaluating the relationship between calling time and the costs incurred for calling with non-package, then students create a new graph. The student's answer in Figure 6 corresponds to the description of the ability to analyze, evaluate, and create (Anderson and Krathwohl, 2001; McNeil, 2011; Widana, 2017). Based on the level in the PISA framework, students' ability to analyze to draw graphs is included in level 6 because it is seen that students can create concepts between the x-axis and y-axis, utilize information, and apply insights to develop new strategies (OECD, 2018). It can be seen in Figure 6 that students present graphs and can read clear information from the displayed graphs. In Figures 7 (a) and 7 (b) students analyze answers by paying attention to the definition of a function and relating it to the condition of the relationship between non-packet calling time and the cost, then students also evaluate it by comparing it with the definition of a non-function (shown in Figure 7(b)) . The students' answers in Figure 7 correspond to the description of the ability to analyze and evaluate (Anderson and Krathwohl, 2001; McNeil, 2011; Widana, 2017). Based on the PISA framework, students meet ability levels 4 and 5, because it appears that students can model real situations, determine assumptions, interpret the relationship between calling time and cost, relate existing information, and to decide that the relationship between calling time and non-package calling costs is a function with the correct arguments. Based on students' answers, it can be seen that the

designed student worksheet is able to bring out students' HOTS abilities. This is in accordance with the jumping task criteria, namely the task given is challenging and requires the HOTS ability to complete it (Saito, 2015; Hobri, 2016). CONCLUSION Based on the student worksheet development process, a valid and practical student worksheet has been produced. The student worksheet is declared content valid because it is in accordance with level HOTS in taxonomy bloom and PISA framework, the student worksheet is valid in terms of constructs because it is in accordance with the material contained in the 2013 curriculum in eight graders. The student worksheet is also practical which shows that it can be used by students, students understand the purpose of activities or problems in the student worksheet, and support student ability namely HOTS. AKNOWLEDGEMENTS This article is part of a research project funded by a professional research grant from the Universitas Sriwijaya with the letter number of the Chancellor's letter number 0014/ UN9/SK.LP2M.PT/2021 with the research contract number 0127/UN9/SB3.LP2M.PT/2021. REFERENCES [1] Abdullah, A.H., Abidin, N.L.Z., & Ali, M. (2015). Analysis of Students' Errors in Solving Higher Order Thinking Skills (HOTS) Problems for the Topic of Fraction. Asian Social Science, 11 (21), 133-142. http://dx.doi.org/10.5539/ass.v11n21p133. [2] Abosalem, Y. (2016). Assessment techniques and students' higher-order thinking skills. International Journal of Secondary Education, 4(1), 1–11. https://doi.org/10.11648/j.ijsedu.20160401.11. [3] Anderson, L. & Krathwohl, D. (eds.) (2001). A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives. New York: Longman. [4] Bakker, A. (2019). Design Research in Education: A Practical Guide for Early Career Researhers. London: Routledge. [5] Bakry & Bakar, M. N. B. (2015). The Process of Thinking among Junior High School Students in Solving HOTS Question. International Journal of Evaluation and Research in Education, 4 (3), 138-145. https://eric.ed.gov/?id=EJ1091703. [6] Effendi, R. (2017). Konsep Revisi Taksonomi bloom dan Implementasinya pada Pelajaran Matematika SMP. [Bloom's Taxonomy Revision Concept and Its Implementation in Middle School Mathematics Lessons.]. JIPMat. https://doi.org/10.26877/jipmat.v2i1.1483. [7] Elfeky, A. I. M. (2019). The Efect of Personal Learning Environments on Participants' Higher Order Thinking Skills and Satisfaction. Innovations in Education and Teaching International, 56(4), 505–516. https://doi.org/10.1080/14703297.2018.1534601. [8] Fitriati, F. & Novita, R. (2018, 27-28 June). Designing Student Worksheet for Rich Mathematical Tasks. Paper presented at The 6th South East Asia Design Research International Conference (6th SEA-DR IC), Banda Aceh, Indonesia. https://iopscience.iop.org/article/10.1088/1742-6596/1088/1/012029/meta. [9] Gustiningsi, T. (2015). Pengembangan Soal Pengayaan Model PISA Level 4 Kelas VII SMP. [Developing of Enrichment PISA-Like Problem Level 4 for Seventh Graders]. Jurnal Pendidikan Matematika JPM RAFA, 2(2), 198–213. http://jurnal.radenfatah.ac.id/index.php/jpmrafa/article/view/1248. [10] Gustiningsi, T., & Utari, R. S. (2020). Developing of Higher Order Thinking Skill (HOTS) Mathematical Problems With Cartesian Coordinate Material. Paper presented at The 4th Sriwijaya University Learning and Education, 513, 561–566. https://doi.org/10.2991/assehr.k.201230.163. [11] Gustiningsi, T. & Somakim. (2021). Pengembangan Soal Matematika Tipe PISA Level 5 Dengan Konteks Pribadi. [Developing of PISA-Like Mathematics Problem of Level 5 and Personal Context]. AKSIOMA, 10 (2), 915-926. https://doi.org/10.24127/ajpm.v10i2.3535. [12] Hobri. (2016). Lesson Study for Learning Community: Review of Short Term on Lesson Study V in Japan. Proceedings of National Seminar of Mathematics Education, Madura, 28 May 2016, p.12-21. [13] Hobri, Ummah, I. K., Yuliati, N., & Dafik. (2020). The Effect of Jumping Task Based on Creative Problem Solving on Students' Problem Solving Ability. International Journal of Instruction, 13 (1), 387 - 406. https://eric.ed.gov/?id=EJ1239202. [14] Hwang, G., Lai, C., Liang, J., Chu, H., & Tsai, C. (2017). A long-term experiment to investigate the relationships between high school students' perceptions of mobile

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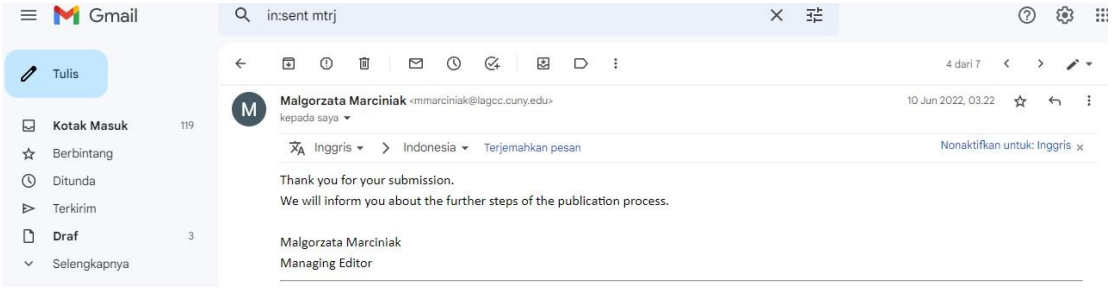

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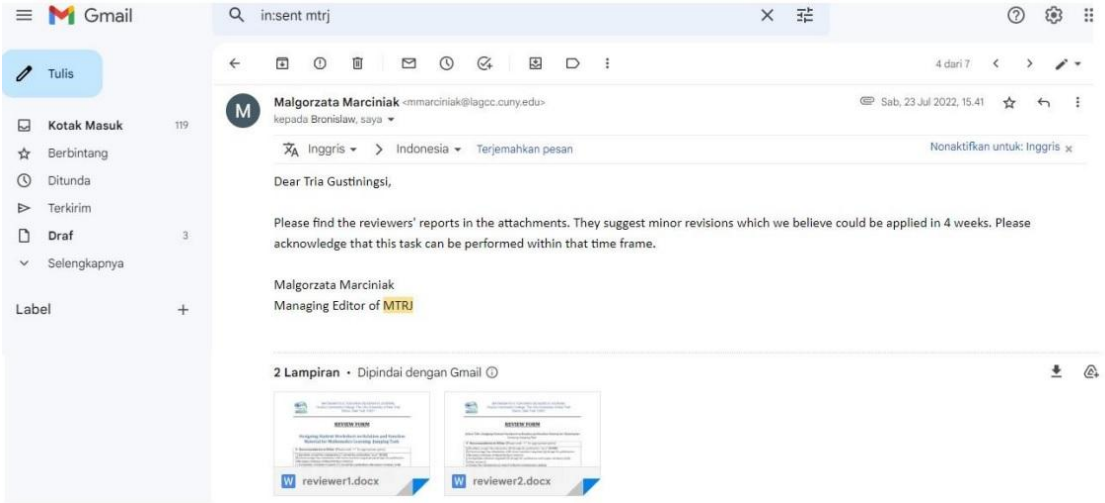

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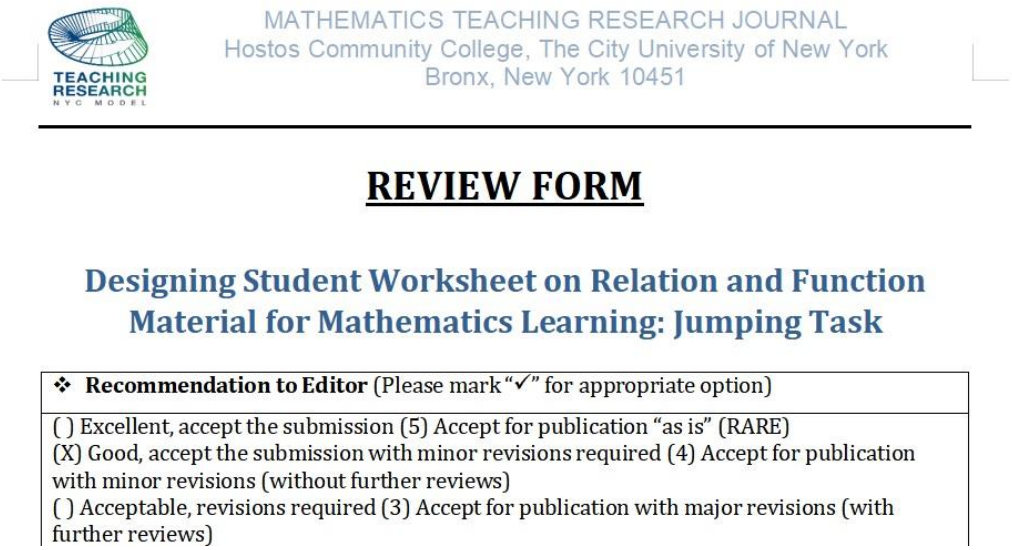

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MATHEMATICS TEACHING RESEARCH JOURNAL
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Designing Student Worksheet on Relation and Function Material for Mathematics Learning: Jumping Task

❖ **Recommendation to Editor** (Please mark "✓" for appropriate option)
( ) Excellent, accept the submission (5) Accept for publication "as is" (RARE) (X) Good, accept the submission with minor revisions required (4) Accept for publication with minor revisions (without further reviews) ( ) Acceptable, revisions required (3) Accept for publication with major revisions (with further reviews) ( ) Decline the submission (2) Reject without resubmission (RARE)

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❖ **Evaluation** (Please evaluate the manuscript by grade 2-5)	
5=Excellent 4=Good 3=Average 2=Below Average	
Items	**Grade brief description**
Contribution to existing knowledge What is the paper about? Does it propose a new idea, new approach? How does it fit in MTRJ mission in terms of classroom involvement and in terms of research involvement? Who is the possible audience?	4, This manuscript provides interesting research on higher order thinking in mathematical learning using "jumping tasks" and is well developed and contributes to the knowledge base.
Organization and readability Language and vocabulary. Does the paper need proofreading and help with English?	4, The paper was organized and readable.
Motivation or justification Why the didactic proposal is made? The research problem or other studies of similar characteristics are presented	4, The motivation is well presented and appropriate.
Soundness of methodology Is the methodology creative, new? Had the authors carried their investigation under ordinary classroom conditions or very specific ones? Have the authors provided a methodological and practical guidelines based on the classroom teaching experiment to implement their suggestions	4, The methodology seemed appropriate for the purpose of this study.

in other classrooms? Are the methods and experimental settings reproducible by large number of teachers in their classrooms?	
Results Evidence of the development of the proposal in the classroom. Are student answers and teachers' comments included in the submission? Analysis of an overall perspective of the development of the activity. Difficulties in the course of implementation.	3, The results are appropriate for the study, but needs to be connected to classroom practice in a separate Discussion and the Conclusion section.
Evidence supports conclusion Clear goal and conclusions of the presentation	4, Overall, this study seems to support its conclusions.
Adequacy of literature review Motivation for the investigations and placing the work in the existing knowledge	4, The literature review seems appropriate and comprehensive for the paper.

❖ **Strengths**

This manuscript provides interesting research on higher order thinking in mathematical learning using "jumping tasks." It seems to be well written and timely. It connects directly to classroom teaching in a way to improve student learning. The study is well grounded in the literature and international studies in STEM such as the TIMSS and PISA.

❖ **Weaknesses**

I would recommend separating the Results and Discussion sections in the paper. Discussion seems to be subheading on p. 14, but I would separate this out. I would also expand the Conclusion section in which you might consider future research and use in the classroom here.

I would recommend clearing defining "jumping task" in the introduction to the paper. It is mostly clear what it means, but all readers may not be sure.

On p. 7, fix: Level Cognitif

Top of p. 15 paragraph… please fix: answers. right.

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❖ **Evaluation** (Please evaluate the manuscript by grade 2-5)	
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Items	**Grade brief description**
Contribution to existing knowledge What is the paper about? Does it propose a new idea, new approach? How does it fit in MTRJ mission in terms of classroom involvement and in terms of research involvement? Who is the possible audience?	4. This study is aligned with the MTRJ mission and presents classroom evidence. The possible audience is both researchers and mathematics teachers.
Organization and readability Language and vocabulary. Does the paper need proofreading and help with English?	4. I am not a native English speaker, but the vocabulary used by the authors is clear and simple for the research and teaching community.
Motivation or justification Why the didactic proposal is made? The research problem or other studies of similar characteristics are presented	4. The introduction presents the rationale for this study. The background information it uses is relevant and up to date. Could the authors extend the review in the sense of the PISA framework and Bloom's taxonomy?
Soundness of methodology Is the methodology creative, new? Had the authors carried their investigation under ordinary classroom conditions or very specific ones? Have the authors provided a methodological and practical guidelines based on the classroom teaching experiment to implement their suggestions in other classrooms? Are the methods and experimental settings	3. The methodological description is adequate. Authors should include the age of Year 8 students, it will make reading easier for the international community. Can the scoring rubric be presented?

reproducible by large number of teachers in their classrooms?	
Results Evidence of the development of the proposal in the classroom. Are student answers and teachers' comments included in the submission? Analysis of an overall perspective of the development of the activity. Difficulties in the course of implementation.	4. The results are relevant. Improve Figure 2 (prototype I). It is too big to follow. Better to divide into smaller ones. Since it is not a handwritten transcript, the English version can be presented directly. The same is true for Figure 3 (prototype II). Check the translation in Figure 4. The word "Solusion" is not correct. Separate Figure 3 into two, one for each fragment.
Evidence supports conclusion Clear goal and conclusions of the presentation	3. Put the two sections together "Discussion and conclusions". Otherwise it seems that the conclusions are few, when in fact this is not the case. The discussion should no longer refer to individual cases, as for example in Figure 4, but should be a general reflection of all pupils. Describe future perspectives and limitations of the study.
Adequacy of literature review Motivation for the investigations and placing the work in the existing knowledge	3. The background information used is relevant and up to date. Could the authors extend the review in the sense of the PISA framework and Bloom's taxonomy?

❖ **Strengths**

Results.

❖ **Weaknesses**

Methodology. Read the suggestions for the author/s

❖ **Suggestions to Author/s**

Abstract

The summary is too long. It should be around 150 words to be more or less homogeneous with the rest of the manuscripts in the journal.

Introduction

The introduction presents the rationale for this study. The background information it uses is relevant and up to date. Could the authors extend the review in the sense of the PISA framework and Bloom's taxonomy?

Methodology

Including the age of eighth grade students will facilitate the reading for the international

community. Can the scoring rubric be presented?

Results

Improve Figure 2 (prototype I). It is too big to follow. Better to divide into smaller ones. Since it is not a handwritten transcript, the English version can be presented directly. The same is true for Figure 3 (prototype II).

Check the translation in Figure 4. The word "Solusion" is not correct. Separate Figure 3 into two, one for each fragment.

Discussion and conclusions

Put both sections together. Otherwise it seems that the conclusions are too few, when in fact this is not the case. The discussion should no longer refer to individual cases, as for example in Figure 4, but should be a general reflection of all students. Describe future perspectives and limitations of the study.

Others

Check the author references within the text. In some of them the sign ":" appears.

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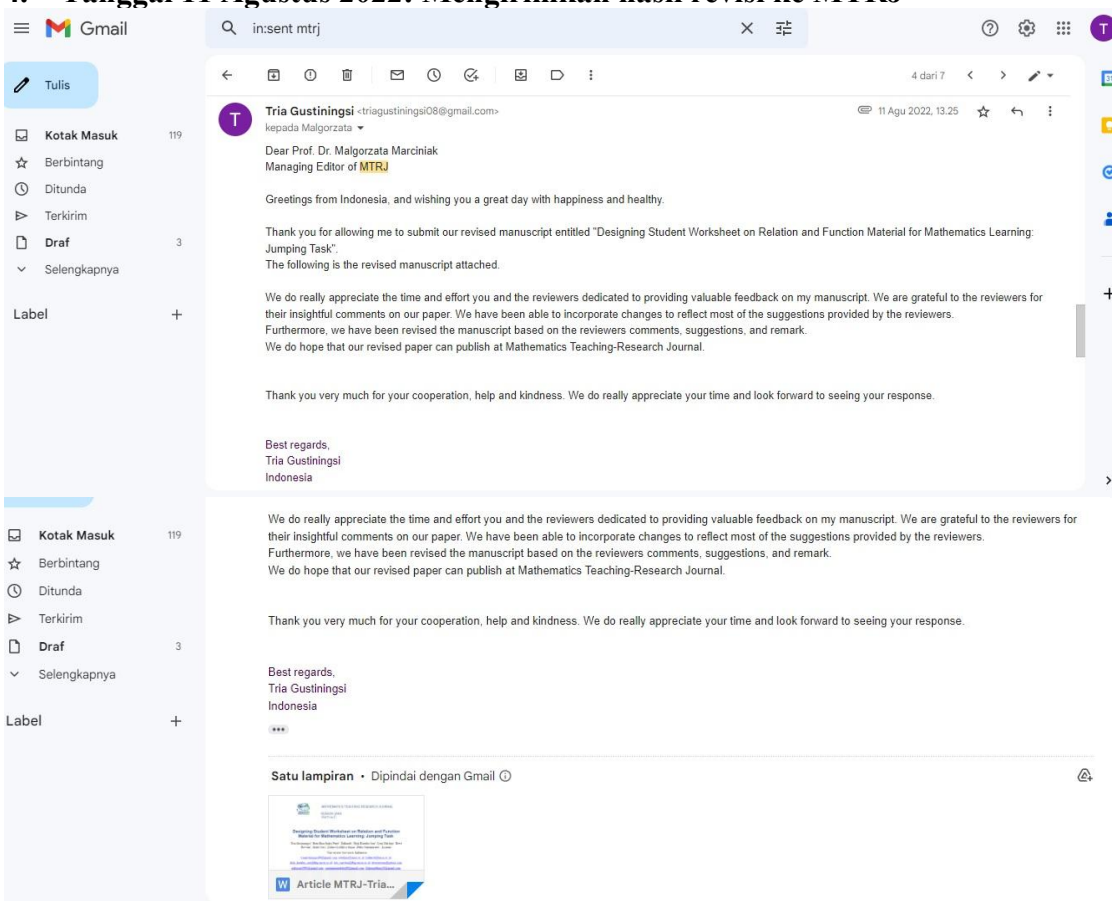

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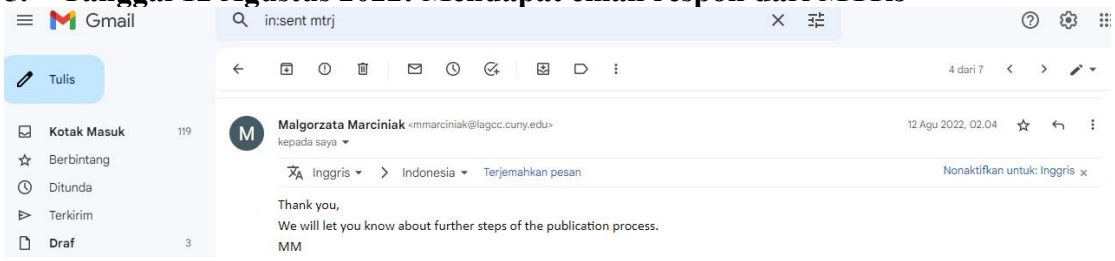

Gambar 8. Email respon dari MTRJ

Designing Student Worksheet on Relation and Function Material for Mathematics Learning: Jumping Task

Tria Gustiningsi[1], Ratu Ilma Indra Putri[1], Zulkardi[1], Diah Kartika Sari[1], Leni Marlina[1], Dewi Rawani[1], Arika Sari[1], Zahara Luthfiya Azmi[1], Delia Septimiranti[1] , Lisnani[1]

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Abstract: This study aims to produce a jumping task in the form of a student worksheet which is valid and practical. Design research in the form of development studies was chosen in this study which consist of preliminary stage and prototyping stage. Data were collected by walk through, test, questionnaire, and interview. Data were analyzed descriptively. Student worksheet is declared valid in terms of content, construct, and language. The results of this study show that the student worksheet is valid and practical. The student worksheet is in accordance with the HOTS level in the taxonomy of Bloom and the PISA framework, in accordance with the curriculum and the material for eight grade, and in accordance with the General Guidelines for Indonesian Spelling (PUEBI) and did not cause multiple interpretations. Then, the students understand the instructions or questions in the student worksheet and it can be used by students.

Keywords: HOTS, Jumping Task, Student Worksheet

INTRODUCTION

Creativity, critical thinking, communication, and collaboration (4C) or often referred to as higher order thinking skills (HOTS) are needed by student in the 21st century (Kemdikbud, 2017; Putri, 2018; Hwang, et al., 2017). Educators, researchers, and various parties state that HOTS is very important for everyone (Bakry & Bakar, 2015; Abosalem 2016; Tambunan & Naibaho, 2019; Elfeky 2019; Lu, 2021; Gustiningsi & Somakim, 2021; Utari & Gustiningsi, 2021; Gustiningsi & Utari, 2021).

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There is a relationship between HOTS in Bloom's Taxonomy and PISA framework. In Bloom's taxonomy, HOTS is at a high level, which consist of analyzing, evaluating, and creating (C4, C5, and C6) (Efendi, 2017). In the Program for International Student Assessment (PISA), there are questions at level 4,5,6 which is HOTS level (Setiawan, Dafik, & Lestari, 2014). Based on indicators, there is a match between the Bloom's taxonomy and the PISA framework. Level 4 in PISA describing that students can make model concrete situations, make assumptions, choose and integrate different interpretations, relate information they have and give arguments or communicate them (OECD, 2018). In Bloom's Taxonomy, level 4 describing that the ability to break down information into pieces of information and detect the relationship of information to one another and to the overall structure and purpose (Anderson and Krathwohl, 2001; McNeil, 2011; Widana, 2017). This description shows that they have the same ability to analysis or relate information to provide arguments and solve problems. Then, level 5 in PISA describing that students can develop models for complex situations, identify constraints and determine assumptions, select, compare, and evaluate appropriate problem solving strategies, formulate and communicate their interpretations and reasons (OECD, 2018). In Bloom's taxonomy, level 5 describing that students make judgments or decisions based on criteria and standards (Anderson and Krathwohl, 2001; McNeil, 2011; Widana, 2017). This description shows that they have the same ability to evaluate and identify criteria or several things and make decisions. Then, level 6 in PISA describing that students can conceptualize, generalize, and utilize information based on investigation and modeling of complex problem situations, apply mathematical insights and understanding to develop new approaches and strategies, reflect and formulate as well as communicate appropriately actions and reflections on their findings (OECD, 2018). In Bloom's Taxonomy, level 6 describing that student putting elements together to form a new shape (Anderson and Krathwohl, 2001; McNeil, 2011; Widana, 2017). This description shows that they have the same ability to create something new based on the information possessed by students.

The PISA results show that Indonesian students' mathematical literacy skills are still low (OECD, 2019). In 2018, in the field of mathematics, Indonesia was ranked 72 out of 78 countries (OECD, 2019). Likewise in Trends in International Mathematics and Science Study (TIMSS), in 2016 Indonesia was ranked 44th out of 49 countries (Utomo, 2021). Previous research analyzed students' HOTS abilities, including students' critical thinking skills (Gustiningsi, 2015), students' ability to solve HOTS problems (Abdullah, et al, 2015), and showed that students' HOTS abilities were still low.

HOTS ability can be improve through learning in class. Bakri and Bakar (2015) stated that students abilities can be developed through activities and mathematics learning. Teachers must pay attention to students so that they can develop students' HOTS abilities (Purnomo, et al., 2021; Pasani & Suryaningsih, 2021).

One of methods that can be done to develop students' HOTS abilities is designing student worksheets to be used in class. Previous research shows that student worksheet is able to improve students' abilities such as students' concept understanding (Nursyahidah, Putri, & Somakim, 2013), students' problem solving abilities (Fitriati & Novita, 2018) and students' creative thinking skills (Romli, Abdurrahman, & Riyadi, 2018). The student worksheet must

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meet the HOTS criteria. Sato stated that to improve the quality of learning, the quality of the tasks given is influential, one of the tasks given was in the form of a challenging task or called a jumping task (Saito, 2015).

Sato stated that the HOTS task was related to the jumping task applied in lesson study (Putri, 2018; Putri & Zulkardi, 2019; Hobri, 2020). Jumping tasks are effective in supporting students' HOTS abilities (Putri, 2018), one of which is problem solving skills (Hobri, et al., 2020).

Previous research has designed jumping tasks using the PISA framework (Zulkardi & Putri, 2020; Putri & Zulkardi, 2019), with an RME approach (Sa'id, et al., 2021), and based on an open-ended questions (Ummah, et al., 2021). Meanwhile, this study designed the jumping task in the form of a student worksheet using the PISA framework and adjusted the worksheet to the HOTS level in the Bloom's taxonomy. This study aims to produce a valid and practical jumping task-based student worksheet.

RESEARCH METHOD

Design research in the form of development studies was chosen in this study (Bakker, 2019). The research subjects were 20 eight graders with an average age of 14 years old. The stages carried out are the preliminary stage and the prototyping stage (Tessmer, 1993; Zulkardi, 2002; Akker, et al., 2013) as shown in Figure 1.

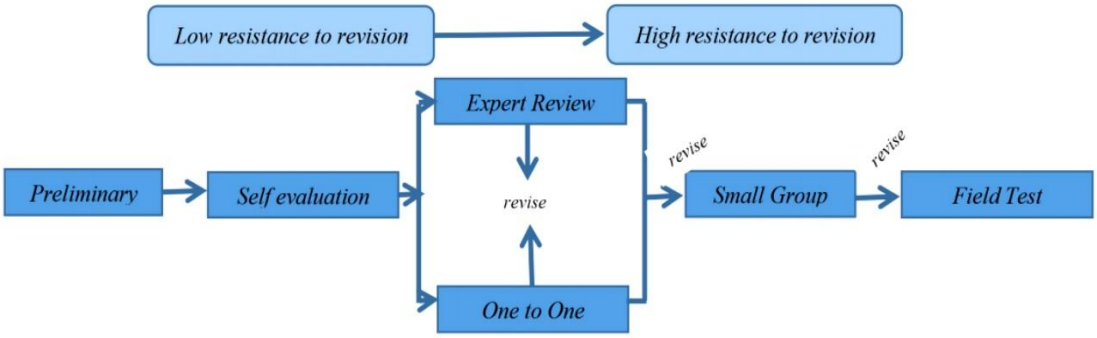

Figure 1: Prototyping Flow (Tessmer, 1993; Zulkardi, 2002; Akker,et al., 2013)

In the preliminary stage, preparations were made to develop a jumping task in the form of a student worksheet, including analyzing eight graders' materials, analyzing research subjects, and analyzing HOTS levels in the taxonomy of Bloom, and analyzing levels in the PISA framework. Furthermore, the prototyping stage starts from the first stage, namely self-evaluation. In the self-evaluation stage, student worksheets were created and self-evaluated (prototype I). The second stage was the stage of expert review and one-to-one. In the expert-review stage, prototype I was validated by experts to see the validity of the student worksheet in terms of content, construct, and language. In the one-to-one stage, prototype I was tested on 2 students who were not research subjects to see the usability of the student worksheet, seen from student answers and

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student comments in interviews while working on the student worksheet and in the questionnaire after completing on the student worksheet. Then, prototype I was analyzed and revised according to suggestions from experts and according to students' comments and answers. The revised student worksheet is called prototype II. Then, prototype II was tested in the small-group stage on 5 students who were not research subjects. The small-group stage was also aimed to see the practicality of the student worksheet based on the answers and comments of students during and after completing on the student worksheet. Furthermore, the student worksheet that had been tested was analyzed and revised, hereinafter referred to as prototype III. Furthermore, prototype III was tested at the field-test stage to 20 students who were research subjects.

Data were collected through walk-through, questionnaires, interviews, and tests. The walk-through was used at the expert-review stage to ask for advice and comments from the expert, while tests, questionnaires, and interviews were used at the one-to-one, small group, and field test stages. The test was used to see the usability of the developed student worksheet (prototype) and to see the students' way of thinking, while the questionnaire and interviews were used to find out comments, constraints, and difficulties, and explore students' ways of thinking when completing the student worksheet. The walk-through was analyzed descriptively. Comments and suggestions from experts were described and used as materials for revising prototype I. The tests were analyzed based on the scoring rubric, then described. The scoring rubric available in Table 1.

No.	Question	Possible Student Answer	Score
1	On Monday afternoon at 16.00 West Indonesian Time, Ani wanted to call her friend for about 5 minutes because she had very important business at the time. Ani is confused whether to just call or register for a talkmania package. Finally, Ani choose to sign up for the talkmania package. Is Ani's decision right? Please describe your reason.	Students can relate the information in the table and compare the price of calling with talkmania packages and non-package prices. Then, the students make decisions about which package should be chosen.	1
		Student can't relate the information in the table and compare the price of calling with talkmania packages and non-packages prices.	0
2	If on Monday afternoon at 16.00 West Indonesian Time, Ani chooses to make a call with a non-package call rate, draw a graph that shows the time between Ani's call and the price she has to pay every minute.	Students can draw a graph that shows the relationship between calling time and costs incurred.	1
		Students can't draw a graph that shows the relationship between calling time and costs incurred.	0

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No.	Question	Possible Student Answer	Score
3	Is the relationship between time and the price of this non-packaged call called a function? Describe your reasons.	Students analyzed answers by paying attention to the definition of a function and relating it to the condition of the relationship between non-packet calling time and the cost.	1
		Students can't analyzed answers by paying attention to the definition of a function and relating it to the condition of the relationship between non-packet calling time and the cost.	0

Table 1: The scoring rubric for test

Interviews and questionnaires were analyzed descriptively, then used as supporting information in the development process. The student worksheet is said to be valid in terms of content and construct seen at the expert review stage. The student worksheet is said to be valid in terms of content if it is in accordance with the HOTS level in the Bloom's taxonomy and PISA framework and is valid in terms of constructs if it is in accordance with the curriculum. Student worksheet is said to be practical if it can be understood by students, can be completed, does not cause multiple interpretations, and students are interested in doing it.

RESULTS

The student worksheet had been developed in two stages, namely preliminary and prototyping. The preliminary stage was carried out by analyzing the curriculum, determining the material, analyzing HOTS criteria in Bloom's taxonomy, and analyzing HOTS criteria in PISA framework. A description of the HOTS levels in Bloom's taxonomy and the PISA framework is provided in Table 2.

Level	Bloom's Taxonomy	PISA Framework
Level 4	Analysis: The ability to break down information into pieces of information and detect the relationship of information to one another and to the overall structure	Students can model concrete situations, make assumptions, choose and integrate different interpretations, relate information they have and give arguments or communicate them (OECD, 2018).

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Level	Bloom's Taxonomy	PISA Framework
	and purpose. (Anderson and Krathwohl, 2001; McNeil, 2011; Widana, 2017)	
Level 5	Evaluation: Make judgments or decisions based on criteria and standards (Anderson and Krathwohl, 2001; McNeil, 2011; Widana, 2017)	Students can develop models for complex situations, identify constraints and determine assumptions, select, compare, and evaluate appropriate problem solving strategies, formulate and communicate their interpretations and reasons (OECD, 2018).
Level 6	Create: Putting elements together to form a new shape (Anderson and Krathwohl, 2001; McNeil, 2011; Widana, 2017)	Students can conceptualize, generalize, and utilize information based on investigation and modeling of complex problem situations, apply mathematical insights and understanding to develop new approaches and strategies, reflect and formulate as well as communicate appropriately actions and reflections on their findings (OECD, 2018).

Table 2: Cognitive level of HOTS category in taxonomy bloom and PISA framework

As Table 2 indicates, there is a match between levels 4,5,6 in the Bloom's taxonomy and the PISA framework. Thus, it can be formulated that the HOTS level consists of the ability to analyze, evaluate, and create. Next, the prototyping stage was carried out in the self-evaluation stage. In the self-evaluation stage, student worksheets were compiled and prototype I was produced. Prototype I is presented in Figure 2.

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Available calling rates as shown in Figure 1 and Figure 2.

Talkmania (TM) information	TM Day	TM night	TM Double
TM Rate	Rp 2.500	Rp 2.500	Rp 12.500
TM package you get	call package 200 minutes (Monday – Friday) call package 250 minutes (Saturday – Sunday)	call package 150 minutes	Call package 150 minutes per day for 6 days
Registration time	01.00 – 16.30 West indonesian time	17.00 – 23.30 West indonesian time	01.00 – 12.00 West indonesian time
Usage Time	01.00 – 18.00 local time	17.00 – 24.00 local time	01.00 – 17.00 local time

Figure 1. Talkmania Package Call Rates

Telephone

00.00– 16.59
Rp 109/5 seconds, next Rp 32/5 seconds for 60 seconds. Repeating scheme. Rate for Sunday: Rp 192/10 seconds for 300 seconds, next Rp 0/minute for 600 seconds. Repeating scheme.

17.00 – 23.59
Rp 99/5 seconds for 60 seconds, next Rp 30/5 seconds for 60 seconds. Repeating scheme. Rate for Sunday: Rp 174/10 seconds for 300 seconds, next Rp 0/minute for 600 seconds. Repeating scheme.

Figure 2. Non-package call rates

On Monday afternoon at 16.30 West Indonesian Time , Ani wanted to call her friend for about 5 minutes because she had very important business at that time. Ani is confused whether to just call or register for a talkmania package. Finally, Ani chose to sign up for the talkmania package. Is Ani's decision right? Please describe your reason.

If on Monday afternoon at 16.30 West Indonesian Time, Ani chooses to make a call with a non-package call rate, draw a graph that shows the time between Ani's call and the price she has to pay every minute.

Is the relationship between time and the price of this non-packaged call called a function? Describe your reasons.

Figure 2: Prototype I

For the ability to analyze, the student worksheet provides a table of tariff for calling and non-package, which shows the price, registration time and usage time. This table presents information that must be analyzed by students in order to be able to answer the questions in the student worksheet. Then, for the ability to evaluate, the question "whether Ani's choice is right", is a stimulating question so that the students can judge or choose on the answer based on the information that has been analyzed previously. For creative skills, the question to draw a graph and the question “is the relationship between time and price a function” stimulates students to make a graph and create an argument in the form of a picture or another to answer the question. The relationship between the student worksheet and the HOTS level can be seen in Table 3.

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Student Worksheet	Level Cognitive

Available calling rates as shown in Figure 1 and Figure 2.

Talkmania (TM) information	TM Day	TM night	TM Double
TM Rate	Rp 2.500	Rp 2.500	Rp 12.500
TM package you get	call package 200 minutes (Monday – Friday) call package 250 minutes (Saturday – Sunday)	call package 150 minutes	Call package 150 minutes per day for 6 days
Registration time	01.00 – 16.30 West indonesian time	17.00 – 23.30 West indonesian time	01.00 – 12.00 West indonesian time
Usage Time	01.00 – 18.00 local time	17.00 – 24.00 local time	01.00 – 17.00 local time

Figure 1. Talkmania Package Call Rates

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17.00 – 23.59
Rp 99/5 seconds for 60 seconds, next Rp 30/5 seconds for 60 seconds. Repeating scheme. Rate for Sunday: Rp 174/10 seconds for 300 seconds, next Rp 0/minute for 600 seconds. Repeating scheme.

Figure 2. Non-package call rates

Analysis

On Monday afternoon at 16.30 West Indonesian Time , Ani wanted to call her friend for about 5 minutes because she had very important business at that time. Ani is confused whether to just call or register for a talkmania package. Finally, Ani chose to sign up for the talkmania package. Is Ani's decision right? Please describe your reason.

Analysis dan Evaluation

If on Monday afternoon at 16.30 West Indonesian Time, Ani chooses to make a call with a non-package call rate, draw a graph that shows the time between Ani's call and the price she has to pay every minute.

Analysis, Evaluation, and Create

Is the relationship between time and the price of this non-packaged call called a function? Describe your reasons.

Analysis dan Evaluation

Table 3: Student worksheet relationship with HOTS level

Then, prototype I was validated by the expert at the expert review stage. The expert provided suggestions and comments consisting of: 1) Please add pictures that can attract students' attention, 2) Non-package data is simplified to 60 seconds, 3) The call package tariff table should be retyped so that it is clear, 4) It is in accordance with the HOTS level based of taxonomy bloom and PISA framework, 5) It is in accordance with curriculum and material for eight graders.

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In parallel, prototype I was tested on 2 students at the one-to-one stage. Based on the students' answers in the one-to-one stage, the students were confused about the non-package price and they were confused about changing the price per second on the non-package tariff.

Based on the expert- review and one-to-one stage, prototype I was analyzed and revised with the revision decision. The revised decision consist of: 1) Add pictures that can attract students' attention, 2) Non-package data simplified to 60 seconds, 3) Rate table retyped. The revised student worksheet is called prototype II, as shown in Figure 3.

ACTIVITY INSTRUCTIONS:
1. Discuss with your group to answer the questions provided.
2. Write your answers in the space provided.

Call rates are available as shown in Table 1 and Table 2.

Table 1. Talkmania Package Call Rates

Talkmania (TM) information	TM Day	TM night	TM Double
TM Rate	Rp 2.500	Rp 2.500	Rp 12.500
TM package you get	call package 200 minutes (Monday – Friday) call package 250 minutes (Saturday – Sunday)	call package 150 minutes	Call package 150 minutes per day for 6 days
Registration time	01.00 – 16.30 West indonesian time	17.00 – 23.30 West indonesian time	01.00 – 12.00 West indonesian time
Usage Time	01.00 – 18.00 local time	17.00 – 24.00 local time	01.00 – 17.00 local time

Source: https://ngelag.com/cara-tm-simpati-nelpon-siang-malang-murah/

Non-package call rates are also available.

Table 2. Non-Package Call Rates

Time	Rate
00.00 - 16.59	Rp 1.300 every 60 seconds (Monday - saturday) Rp 1.100 every 60 seconds (sunday)
17.00 - 23.59	Rp 1.188 every 60 seconds (Monday - saturday) Rp 1.100 every 60 seconds (sunday)

On Monday afternoon at 16.00 West Indonesian Time , Ani wanted to call her friend for about 5 minutes because she had very important business at that time. Ani is confused whether to just call or register for a talkmania package. Finally, Ani chose to sign up for the talkmania package. Is Ani's decision right? Please describe your reason.

If on Monday afternoon at 16.00 West Indonesian Time, Ani chooses to make a call with a non-package call rate, draw a graph that shows the time between Ani's call and the price she has to pay every minute.

Is the relationship between time and the price of this non-packaged call called a function? Describe your reasons.

Figure 3: Protoype II

Prototype II was tested on students in the small group stage to four students. In the small group stage, it can be seen from the students' answers that none of the students were confused about the

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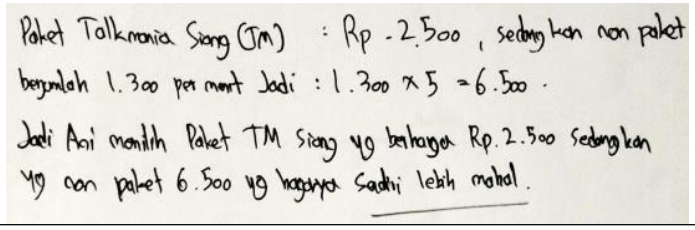
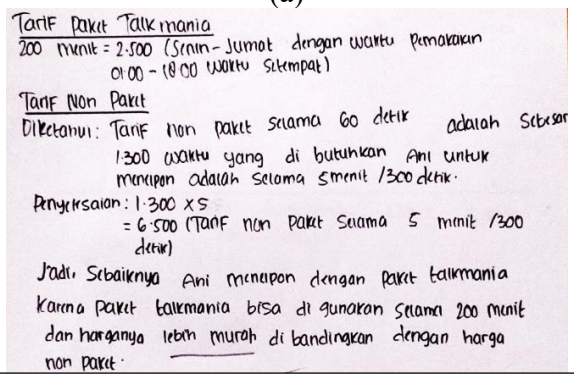
questions on the student worksheet and students stated that they needed a high level of thought to determine the answers on the student worksheet. This is a consideration for the researchers not to revise prototype II because it can practically be done by students and requires high thinking. Then, the student worksheet was tested in the field test stage.

In the field test stage, there were 20 students who were the subjects for the student worksheet test. The students' answers to the first question regarding Ani's decision to choose the talkmania package are as follows.



Translated to English:
Talkmania Day package: IDR 2.500, while the non-package is IDR 1300 per minute, So 1.300 x 5 = 6.500. So, Ani bought the TM Day package for IDR 2500, while the non-package is IDR 6.500 which more expensive.

(a)



Translated to English:
Talkmania package rates
200 minutes = 2.500 (Monday – Friday with usage time are 01.00 – 18.00 local time)

Non-package rates
Known: non-package rates for 60 seconds is 1300, the time which Ani needed to call is 5 minutes or 300 seconds.
Solution:
1.300 x 5 = 6.500 (non-package rates for 5 minutes or 300 seconds). So it's better if Ani call with the talkamnia package because the talkmania package can be used for 200 minutes and the price is cheaper than the non-package price.

(b)

Figure 4: Students' answers to questions about Ani's decision

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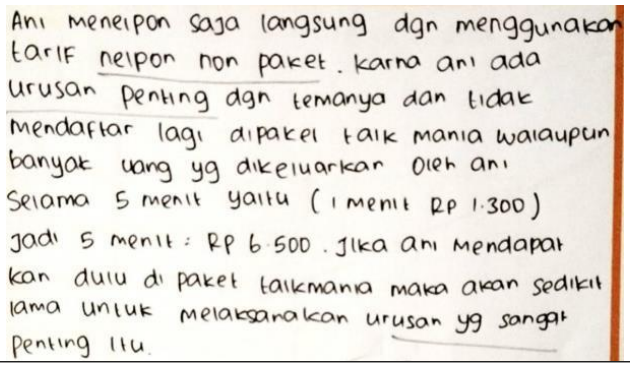
As Figure 4 shows, the students analyzed package and non-package prices and then compared them. They evaluated it by calculating the non-package price for 5 minutes and it can be seen that the non-package price is more expensive than the price for calling with a talkmania package. Then, the students can decide that Ani's choice is right.

In addition, there were students who answered differently from the answers in Figure 4, as shown in Figure 5 below.



Translated to English:

Ani just called directly using a non-package call rate because Ani had important business with her friend and didn't register for the talkmania package even though Ani spent a lot of money for 5 minutes (1 minute IDR 1.300) so 5 minutes was IDR 6.500. If Ani registers in the talkmania package first, it will take a longer time to carry out that very important business.

Figure 5: Different Students' Answers to the First Question

Based on Figure 5, students answered that Ani should call at a non-package rate because it would save time. In Figure 5, it can be seen the students analyzed the price of package and non-package so that they know the cheaper price for calling is making a call with a talkmania package, it is also seen that the students evaluated Ani's decision by calculating the cost of calling for 5 minutes, but they focused on the sentence "There is an important business right away" which according to the student in Figure 5 that the matter should not be postponed, so students answered the call directly with non-package only with the risk of being more expensive but saving time.

Then, for the second question regarding graphics. Students' answers can be seen in Figure 6.

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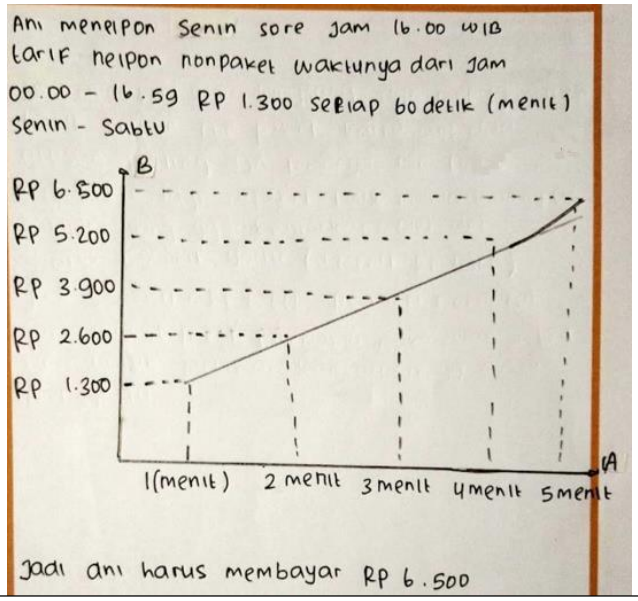
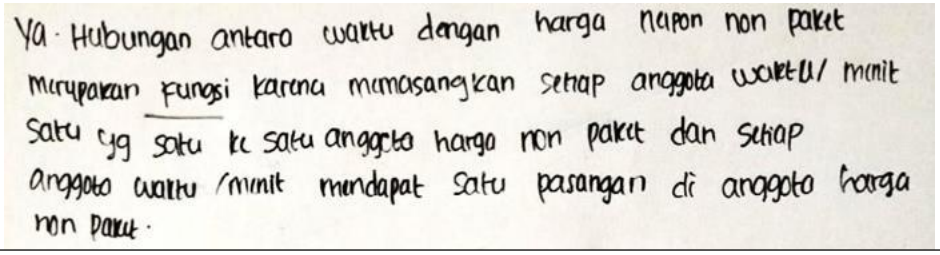


Translated to English:
Ani call at Monday afternoon at 16.00 West Indonesian Time, non-package call rates from 00.00 – 16.59 is IDR 1.300 every 60 seconds.

Figure 6: Student Answers for the Second Question

Based on Figure 6, it can be seen that the students can draw and describe the graph that shows the relationship between the costs incurred when calling with non-package rates and with the length of time calling.

Next is the question of whether the relationship between time and the price of non-packaged calls is a function. The students' answers are shown in Figure 7.



Translate in English:
Yes, the relationship between time and non-package prices is a function because each time member pairs one at a time to a non-packaged price member, the time member gets one pair to a non-packaged price member.

(a)

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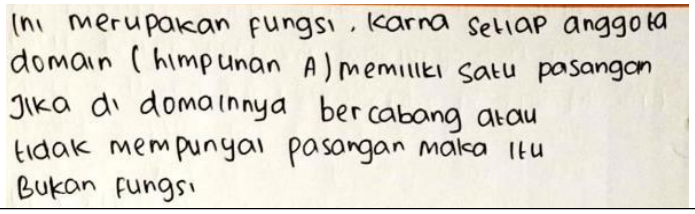

Translate in English:
This is a function because each member of the domain (set A) has one pair. If the domains are forked or have no pairs then it's not a function

(b)

Figure 7: Student Answer for Third Question

Based on Figure 7, the students can determine that the relationship between call time and price is a function. In Figure 7 (b), the students explained the comparison between functions and non-functions. From Figure 7(a) dan 7(b), it can be seen that the students can analyze and evaluate to decide the right answer.

DISCUSSION AND CONCLUSIONS

Akker, et al. (2013) stated that a product is said to be valid if the product developed is based on knowledge or science (content validity) and if the product is consistent with each other or is logical to design (construct validity). Based on the research results, the expert stated that the student worksheet was in accordance with the HOTS level based on the Bloom's taxonomy and the PISA framework. This shows that the student worksheet is valid in terms of content. Then, the expert stated that the student worksheet was in accordance with the 2013 curriculum and that the material chosen was in accordance with the material in class VIII. This shows that the student worksheet is valid in terms of constructs.

Student worksheets are said to be practical if they can be used and are easy to use (Akker, et al., 2013). Based on the development of the prototyping stage from one-to-one to field-tests, students' answers show that they can work on the given student worksheet and are not confused by the questions or information in the student worksheet. This shows that the designed student worksheet is practical.

Students' answers show that the students can relate the information in the table and compare the price of calling with talkmania packages and non-package prices. Then, the students make decisions about which package should be chosen. There are some version of student answer, there are students who choose the talkmania package as calling with the talkmania package is cheaper than the non-packaged one. However, there is student prefer to call with non-package

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with the reason that the process is faster, they pay attention to the sentence “there is an important business right away”.

The students' answer correspond to the description of their ability to analyze and evaluate (Anderson and Krathwohl, 2001; McNeil, 2011; Widana, 2017). Judging from the level in the PISA framework, the students' answer show that they can make models from real situations, make assumptions, are able to interpret tables or available information and relate the information provided in tables and questions in the student worksheet to determine answers. This includes capabilities at level 4 in the PISA framework (OECD, 2018). Then, students are also able to determine which calling package decision should be chosen by including their respective arguments. This includes capabilities at level 5 of the PISA framework.

Then, the students can draw a graph that shows the relationship between calling time and costs incurred. To draw a graph, students analyzed the available information about prices and calling times consisting of days and hours. They evaluated the relationship between calling time and the costs incurred for calling with non-package. Then, the students create a new graph. The student's answer about the graph corresponds to the description of the ability to analyze, evaluate, and create (Anderson and Krathwohl, 2001; McNeil, 2011; Widana, 2017). Based on the level in the PISA framework, the students' ability to analyze to draw graphs is included in level 6 because it is seen that the students can create concepts between the x-axis and y-axis, utilize information, and apply insights to develop new strategies (OECD, 2018). It can be seen in students answer that the students present graphs and can read clear information from the displayed graphs.

The next answer show that students analyzed answers by paying attention to the definition of a function and relating it to the condition of the relationship between non-packet calling time and the cost. Then, the students evaluated it by comparing it with the definition of a non-function. The students' answers about the function correspond to the description of the ability to analyze and evaluate (Anderson and Krathwohl, 2001; McNeil, 2011; Widana, 2017). Based on the PISA framework, the students meet ability levels 4 and 5, because it appears that students can model real situations, determine assumptions, interpret the relationship between calling time and cost, relate existing information, and to decide that the relationship between calling time and non-package calling costs is a function with the correct arguments.

Based on students' answers, it can be seen that the designed student worksheet is able to improve students' HOTS abilities. This is in accordance with the jumping task criteria, namely the task given is challenging and requires the HOTS ability to complete it (Saito, 2015; Hobri, 2016).

Based on the student worksheet development, a valid and practical student worksheet has been produced. The student worksheet is declared valid in terms of content because it is in accordance with level HOTS in taxonomy bloom and PISA framework. The student worksheet is valid in terms of constructs because it is in accordance with the material contained in the 2013 curriculum for eight graders. The student worksheet is also practical which shows that it can be

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used by students, students understand the purpose of activities or problems in the student worksheet, and support student ability namely HOTS.

Suggestion for future learning that this student worksheet can be used for classroom learning to train students' HOTS. For further research, it is possible to develop student worksheets with different materials so that more jumping task-based student worksheet are produced.

AKNOWLEDGEMENTS

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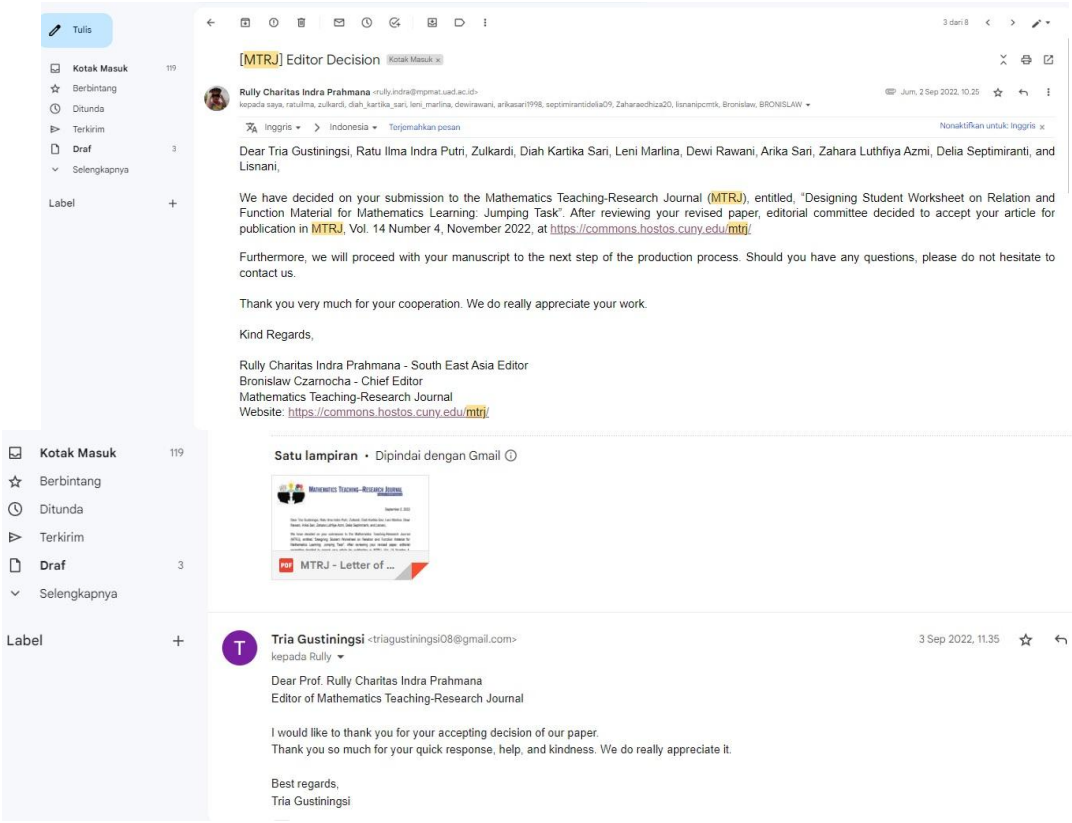
6. **Tanggal 2 September 2022: Mendapat email bahwa Artikel diterima (Accepted) dan mendapat LoA (Letter of Acceptance)**



Gambar 9. Editor Decision MTRJ

MATHEMATICS TEACHING–RESEARCH JOURNAL
Indexed in SCOPUS Database

September 2, 2022

Dear Tria Gustiningsi, Ratu Ilma Indra Putri, Zulkardi, Diah Kartika Sari, Leni Marlina, Dewi Rawani, Arika Sari, Zahara Luthfiya Azmi, Delia Septimiranti, and Lisnani,

We have decided on your submission to the Mathematics Teaching-Research Journal (MTRJ), entitled, "Designing Student Worksheet on Relation and Function Material for Mathematics Learning: Jumping Task". After reviewing your revised paper, editorial committee decided to accept your article for publication in MTRJ, Vol. 14 Number 4, November 2022, at https://commons.hostos.cuny.edu/mtrj/

Furthermore, we will proceed with your manuscript to the next step of the production process. Should you have any questions, please do not hesitate to contact us.

Thank you very much for your cooperation. We do really appreciate your work.

Kind Regards,

Rully Charitas Indra Prahmana - South East Asia Editor
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Designing Student Worksheet on Relation and Function Material for Mathematics Learning: Jumping Task

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Abstract: This study aims to produce a jumping task in the form of a student worksheet which is valid and practical. Design research in the form of development studies was chosen in this study which consist of preliminary stage and prototyping stage. Data were collected by walk through, test, questionnaire, and interview. Data were analyzed descriptively. Student worksheet is declared valid in terms of content, construct, and language. The results of this study show that the student worksheet is valid and practical. The student worksheet is in accordance with the HOTS level in the taxonomy of Bloom and the PISA framework, in accordance with the curriculum and the material for eight grades, and in accordance with the General Guidelines for Indonesian Spelling (PUEBI) and did not cause multiple interpretations. Then, the students understand the instructions or questions in the student worksheet, and it can be used by students.

INTRODUCTION

Creativity, critical thinking, communication, and collaboration (4C) or often referred to as higher order thinking skills (HOTS) are needed by student in the 21st century (Kemdikbud, 2017; Putri, 2018; Hwang, et al., 2017). Educators, researchers, and various parties state that HOTS is very important for everyone (Bakry & Bakar, 2015; Abosalem 2016; Tambunan & Naibaho, 2019; Elfeky 2019; Lu, 2021; Gustiningsi & Somakim, 2021; Utari & Gustiningsi, 2021; Gustiningsi & Utari, 2021).

There is a relationship between HOTS in Bloom's Taxonomy and PISA framework. In Bloom's taxonomy, HOTS is at a high level, which consist of analyzing, evaluating, and creating (C4, C5, and C6) (Efendi, 2017). In the Program for International Student Assessment (PISA), there are questions at level 4,5,6 which is HOTS level (Setiawan, Dafik, & Lestari, 2014). Based on

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indicators, there is a match between the Bloom's taxonomy and the PISA framework. Level 4 in PISA describing that students can make model concrete situations, make assumptions, choose, and integrate different interpretations, relate information they have and give arguments or communicate them (OECD, 2018). In Bloom's Taxonomy, level 4 describing that the ability to break down information into pieces of information and detect the relationship of information to one another and to the overall structure and purpose (Anderson and Krathwohl, 2001; McNeil, 2011; Widana, 2017). This description shows that they have the same ability to analysis or relate information to provide arguments and solve problems. Then, level 5 in PISA describing that students can develop models for complex situations, identify constraints and determine assumptions, select, compare, and evaluate appropriate problem-solving strategies, formulate, and communicate their interpretations and reasons (OECD, 2018). In Bloom's taxonomy, level 5 describing that students make judgments or decisions based on criteria and standards (Anderson and Krathwohl, 2001; McNeil, 2011; Widana, 2017). This description shows that they have the same ability to evaluate and identify criteria or several things and make decisions. Then, level 6 in PISA describing that students can conceptualize, generalize, and utilize information based on investigation and modeling of complex problem situations, apply mathematical insights and understanding to develop new approaches and strategies, reflect and formulate as well as communicate appropriately actions and reflections on their findings (OECD, 2018). In Bloom's Taxonomy, level 6 describing that student putting elements together to form a new shape (Anderson and Krathwohl, 2001; McNeil, 2011; Widana, 2017). This description shows that they have the same ability to create something new based on the information possessed by students.

The PISA results show that Indonesian students' mathematical literacy skills are still low (OECD, 2019). In 2018, in the field of mathematics, Indonesia was ranked 72 out of 78 countries (OECD, 2019). Likewise in Trends in International Mathematics and Science Study (TIMSS), in 2016 Indonesia was ranked 44th out of 49 countries (Utomo, 2021). Previous research analyzed students' HOTS abilities, including students' critical thinking skills (Gustiningsi, 2015), students' ability to solve HOTS problems (Abdullah, et al, 2015), and showed that students' HOTS abilities were still low.

HOTS ability can be improved through learning in class. Bakri and Bakar (2015) stated that students' abilities can be developed through activities and mathematics learning. Teachers must pay attention to students so that they can develop students' HOTS abilities (Purnomo, et al., 2021; Pasani & Suryaningsih, 2021).

One of methods that can be done to develop students' HOTS abilities is designing student worksheets to be used in class. Previous research shows that student worksheet is able to improve students' abilities such as students' concept understanding (Nursyahidah, Putri, & Somakim, 2013), students' problem-solving abilities (Fitriati & Novita, 2018) and students' creative thinking skills (Romli, Abdurrahman, & Riyadi, 2018). The student worksheet must meet the HOTS criteria. Sato stated that to improve the quality of learning, the quality of the tasks given is influential, one of the tasks given was in the form of a challenging task or called a jumping task (Saito, 2015).

Sato stated that the HOTS task was related to the jumping task applied in lesson study (Putri,

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2018; Putri & Zulkardi, 2019; Hobri, 2020). Jumping tasks are effective in supporting students' HOTS abilities (Putri, 2018), one of which is problem solving skills (Hobri, et al., 2020).

Previous research has designed jumping tasks using the PISA framework (Zulkardi & Putri, 2020; Putri & Zulkardi, 2019), with an RME approach (Sa'id, et al., 2021), and based on an open-ended question (Ummah, et al., 2021). Meanwhile, this study designed the jumping task in the form of a student worksheet using the PISA framework and adjusted the worksheet to the HOTS level in the Bloom's taxonomy. This study aims to produce a valid and practical jumping task-based student worksheet.

RESEARCH METHOD

Design research in the form of development studies was chosen in this study (Bakker, 2019). The research subjects were 20 eight graders with an average age of 14 years old. The stages carried out are the preliminary stage and the prototyping stage (Tessmer, 1993; Zulkardi, 2002; Akker, et al., 2013) as shown in Figure 1.

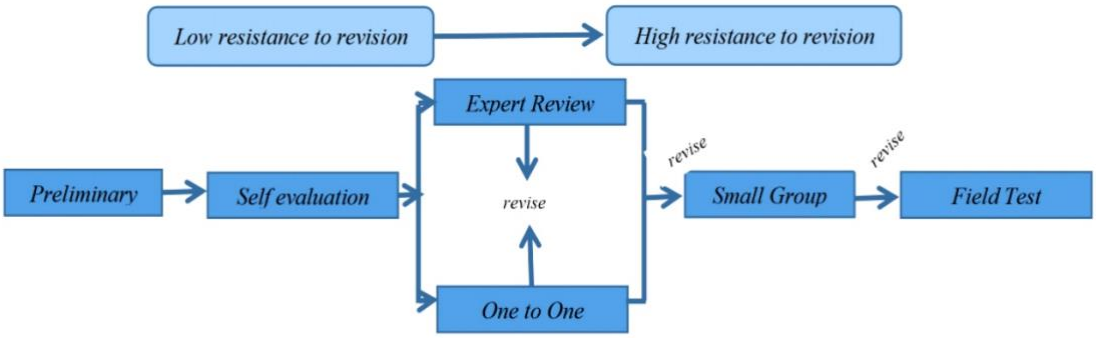

Figure 1: Prototyping Flow (Tessmer, 1993; Zulkardi, 2002; Akker, et al., 2013)

In the preliminary stage, preparations were made to develop a jumping task in the form of a student worksheet, including analyzing eight graders' materials, analyzing research subjects, and analyzing HOTS levels in the taxonomy of Bloom, and analyzing levels in the PISA framework. Furthermore, the prototyping stage starts from the first stage, namely self-evaluation. In the self-evaluation stage, student worksheets were created and self-evaluated (prototype I). The second stage was the stage of expert review and one-to-one. In the expert-review stage, prototype I was validated by experts to see the validity of the student worksheet in terms of content, construct, and language. In the one-to-one stage, prototype I was tested on 2 students who were not research subjects to see the usability of the student worksheet, seen from student answers and student comments in interviews while working on the student worksheet and in the questionnaire after completing on the student worksheet. Then, prototype I was analyzed and revised according to suggestions from experts and according to students' comments and answers. The revised student worksheet is called prototype II. Then, prototype II was tested in the small-group stage

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on 5 students who were not research subjects. The small-group stage was also aimed to see the practicality of the student worksheet based on the answers and comments of students during and after completing on the student worksheet. Furthermore, the student worksheet that had been tested was analyzed and revised, hereinafter referred to as prototype III. Furthermore, prototype III was tested at the field-test stage to 20 students who were research subjects.

Data were collected through walk-through, questionnaires, interviews, and tests. The walk-through was used at the expert-review stage to ask for advice and comments from the expert, while tests, questionnaires, and interviews were used at the one-to-one, small group, and field test stages. The test was used to see the usability of the developed student worksheet (prototype) and to see the students' way of thinking, while the questionnaire and interviews were used to find out comments, constraints, and difficulties, and explore students' ways of thinking when completing the student worksheet. The walk-through was analyzed descriptively. Comments and suggestions from experts were described and used as materials for revising prototype I. The tests were analyzed based on the scoring rubric, then described. The scoring rubric available in Table 1.

Question	Possible Student Answer	Score
On Monday afternoon at 16.00 West Indonesian Time, Ani wanted to call her friend for about 5 minutes because she had very important business at the time. Ani is confused whether to just call or register for a talkmania package. Finally, Ani choose to sign up for the talkmania package. Is Ani's decision right? Please describe your reason.	Students can relate the information in the table and compare the price of calling with talkmania packages and non-package prices. Then, the students make decisions about which package should be chosen.	1
	Student can't relate the information in the table and compare the price of calling with talkmania packages and non-packages prices.	0
If on Monday afternoon at 16.00 West Indonesian Time, Ani chooses to make a call with a non-package call rate, draw a graph that shows the time between Ani's call and the price she has to pay every minute.	Students can draw a graph that shows the relationship between calling time and costs incurred.	1
	Students can't draw a graph that shows the relationship between calling time and costs incurred.	0
Is the relationship between time and the price of this non-packaged call called a function? Describe your reasons.	Students analyzed answers by paying attention to the definition of a function and relating it to the condition of the relationship between non-packet calling	1

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Question	Possible Student Answer	Score
	time and the cost.	
	Students can't analyze answers by paying attention to the definition of a function and relating it to the condition of the relationship between non-packet calling time and the cost.	0

Table 1: The scoring rubric for test

Interviews and questionnaires were analyzed descriptively, then used as supporting information in the development process. The student worksheet is said to be valid in terms of content and construct seen at the expert review stage. The student worksheet is said to be valid in terms of content if it is in accordance with the HOTS level in the Bloom's taxonomy and PISA framework and is valid in terms of constructs if it is in accordance with the curriculum. Student worksheet is said to be practical if it can be understood by students, can be completed, does not cause multiple interpretations, and students are interested in doing it.

RESULTS

The student worksheet had been developed in two stages, namely preliminary and prototyping. The preliminary stage was carried out by analyzing the curriculum, determining the material, analyzing HOTS criteria in Bloom's taxonomy, and analyzing HOTS criteria in PISA framework. A description of the HOTS levels in Bloom's taxonomy and the PISA framework is provided in Table 2.

Level	Bloom's Taxonomy	PISA Framework
Level 4	Analysis: The ability to break down information into pieces of information and detect the relationship of information to one another and to the overall structure and purpose. (Anderson and Krathwohl, 2001; McNeil, 2011; Widana, 2017)	Students can model concrete situations, make assumptions, choose, and integrate different interpretations, relate information they have and give arguments or communicate them (OECD, 2018).
Level 5	Evaluation: Make judgments or decisions based on criteria and standards (Anderson and Krathwohl, 2001; McNeil, 2011; Widana, 2017)	Students can develop models for complex situations, identify constraints and determine assumptions, select, compare, and evaluate appropriate problem-

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Level	Bloom's Taxonomy	PISA Framework
		solving strategies, formulate and communicate their interpretations and reasons (OECD, 2018).
Level 6	Create: Putting elements together to form a new shape (Anderson and Krathwohl, 2001; McNeil, 2011; Widana, 2017)	Students can conceptualize, generalize, and utilize information based on investigation and modeling of complex problem situations, apply mathematical insights and understanding to develop new approaches and strategies, reflect and formulate as well as communicate appropriately actions and reflections on their findings (OECD, 2018).

Table 2: Cognitive level of HOTS category in taxonomy bloom and PISA framework

As Table 2 indicates, there is a match between levels 4,5,6 in the Bloom's taxonomy and the PISA framework. Thus, it can be formulated that the HOTS level consists of the ability to analyze, evaluate, and create. Next, the prototyping stage was carried out in the self-evaluation stage. In the self-evaluation stage, student worksheets were compiled and prototype I was produced. Prototype I is presented in Figure 2.

Available calling rates as shown in Figure 1 and Figure 2.

Talkmania (TM) information	TM Day	TM night	TM Double
TM Rate	Rp 2.500	Rp 2.500	Rp 12.500
TM package you get	call package 200 minutes (Monday – Friday) call package 250 minutes (Saturday – Sunday)	call package 150 minutes	Call package 150 minutes per day for 6 days
Registration time	01.00 – 16.30 West indonesian time	17.00 – 23.30 West indonesian time	01.00 – 12.00 West indonesian time
Usage Time	01.00 – 18.00 local time	17.00 – 24.00 local time	01.00 – 17.00 local time

Figure 1. Talkmania Package Call Rates

Telephone

00.00– 16.59
Rp 109/5 seconds, next Rp 32/5 seconds for 60 seconds. Repeating scheme. Rate for Sunday: Rp 192/10 seconds for 300 seconds, next Rp 0/minute for 600 seconds. Repeating scheme.

17.00 – 23.59
Rp 99/5 seconds for 60 seconds, next Rp 30/5 seconds for 60 seconds. Repeating scheme. Rate for Sunday: Rp 174/10 seconds for 300 seconds, next Rp 0/minute for 600 seconds. Repeating scheme.

Figure 2. Non-package call rates

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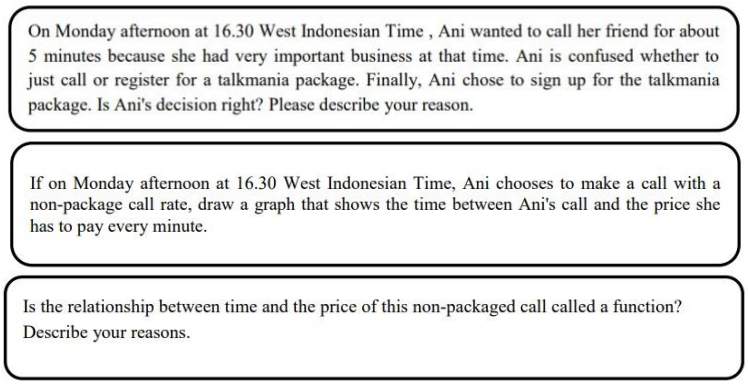

Figure 2: Prototype I

For the ability to analyze, the student worksheet provides a table of tariff for calling and non-package, which shows the price, registration time and usage time. This table presents information that must be analyzed by students to be able to answer the questions in the student worksheet. Then, for the ability to evaluate, the question "whether Ani's choice is right", is a stimulating question so that the students can judge or choose on the answer based on the information that has been analyzed previously. For creative skills, the question to draw a graph and the question “is the relationship between time and price a function” stimulates students to make a graph and create an argument in the form of a picture or another to answer the question. The relationship between the student worksheet and the HOTS level can be seen in Table 3.

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Student Worksheet	Level Cognitive

Available calling rates as shown in Figure 1 and Figure 2.

Talkmania (TM) information	TM Day	TM night	TM Double
TM Rate	Rp 2.500	Rp 2.500	Rp 12.500
TM package you get	call package 200 minutes (Monday – Friday) call package 250 minutes (Saturday – Sunday)	call package 150 minutes	Call package 150 minutes per day for 6 days
Registration time	01.00 – 16.30 West indonesian time	17.00 – 23.30 West indonesian time	01.00 – 12.00 West indonesian time
Usage Time	01.00 – 18.00 local time	17.00 – 24.00 local time	01.00 – 17.00 local time

Figure 1. Talkmania Package Call Rates

Telephone

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Rp 109/5 seconds, next Rp 32/5 seconds for 60 seconds. Repeating scheme. Rate for Sunday: Rp 192/10 seconds for 300 seconds, next Rp 0/minute for 600 seconds. Repeating scheme.

17.00 – 23.59
Rp 99/5 seconds for 60 seconds, next Rp 30/5 seconds for 60 seconds. Repeating scheme. Rate for Sunday: Rp 174/10 seconds for 300 seconds, next Rp 0/minute for 600 seconds. Repeating scheme.

Figure 2. Non-package call rates

Analysis

On Monday afternoon at 16.30 West Indonesian Time , Ani wanted to call her friend for about 5 minutes because she had very important business at that time. Ani is confused whether to just call or register for a talkmania package. Finally, Ani chose to sign up for the talkmania package. Is Ani's decision right? Please describe your reason.

Analysis dan Evaluation

If on Monday afternoon at 16.30 West Indonesian Time, Ani chooses to make a call with a non-package call rate, draw a graph that shows the time between Ani's call and the price she has to pay every minute.

Analysis, Evaluation, and Create

Is the relationship between time and the price of this non-packaged call called a function? Describe your reasons.

Analysis dan Evaluation

Table 3: Student worksheet relationship with HOTS level

Then, prototype I was validated by the expert at the expert review stage. The expert provided suggestions and comments consisting of 1) Please add pictures that can attract students' attention, 2) Non-package data is simplified to 60 seconds, 3) The call package tariff table should be retyped so that it is clear, 4) It is in accordance with the HOTS level based of taxonomy bloom and PISA framework, 5) It is in accordance with curriculum and material for eight graders.

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In parallel, prototype I was tested on 2 students at the one-to-one stage. Based on the students' answers in the one-to-one stage, the students were confused about the non-package price, and they were confused about changing the price per second on the non-package tariff.

Based on the expert- review and one-to-one stage, prototype I was analyzed and revised with the revision decision. The revised decision consists of: 1) Add pictures that can attract students' attention, 2) Non-package data simplified to 60 seconds, 3) Rate table retyped. The revised student worksheet is called prototype II, as shown in Figure 3.

ACTIVITY INSTRUCTIONS:
1. Discuss with your group to answer the questions provided.
2. Write your answers in the space provided.

Call rates are available as shown in Table 1 and Table 2.

Table 1. Talkmania Package Call Rates

Talkmania (TM) information	TM Day	TM night	TM Double
TM Rate	Rp 2.500	Rp 2.500	Rp 12.500
TM package you get	call package 200 minutes (Monday – Friday) call package 250 minutes (Saturday – Sunday)	call package 150 minutes	Call package 150 minutes per day for 6 days
Registration time	01.00 – 16.30 West indonesian time	17.00 – 23.30 West indonesian time	01.00 – 12.00 West indonesian time
Usage Time	01.00 – 18.00 local time	17.00 – 24.00 local time	01.00 – 17.00 local time

Source: https://ngelag.com/cara-tm-simpati-nelpon-siang-malang-murah/

Non-package call rates are also available.

Table 2. Non-Package Call Rates

Time	Rate
00.00 - 16.59	Rp 1.300 every 60 seconds (Monday - saturday) Rp 1.100 every 60 seconds (sunday)
17.00 - 23.59	Rp 1.188 every 60 seconds (Monday - saturday) Rp 1.100 every 60 seconds (sunday)

On Monday afternoon at 16.00 West Indonesian Time , Ani wanted to call her friend for about 5 minutes because she had very important business at that time. Ani is confused whether to just call or register for a talkmania package. Finally, Ani chose to sign up for the talkmania package. Is Ani's decision right? Please describe your reason.

If on Monday afternoon at 16.00 West Indonesian Time, Ani chooses to make a call with a non-package call rate, draw a graph that shows the time between Ani's call and the price she has to pay every minute.

Is the relationship between time and the price of this non-packaged call called a function? Describe your reasons.

Figure 3: Prototype II

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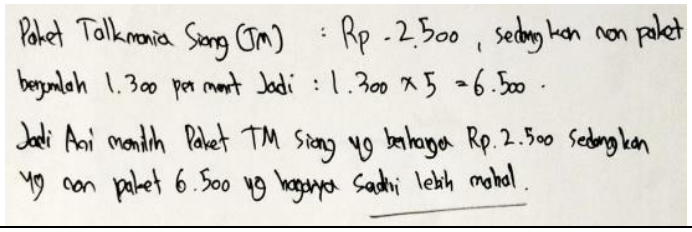
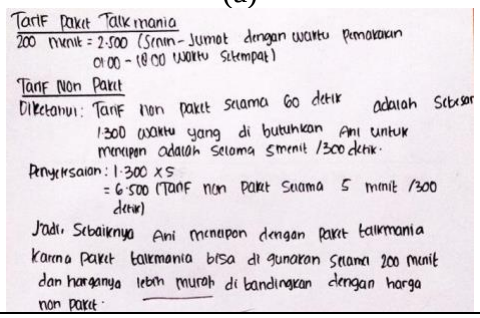
Prototype II was tested on students in the small group stage to four students. In the small group stage, it can be seen from the students' answers that none of the students were confused about the questions on the student worksheet and students stated that they needed a high level of thought to determine the answers on the student worksheet. This is a consideration for the researchers not to revise prototype II because it can practically be done by students and requires high thinking. Then, the student worksheet was tested in the field test stage.

In the field test stage, there were 20 students who were the subjects for the student worksheet test. The students' answers to the first question regarding Ani's decision to choose the talk mania package are as follows.



Translated to English:
Talkmania Day package: IDR 2.500, while the non-package is IDR 1300 per minute, So 1.300 x 5 = 6.500. So, Ani bought the TM Day package for IDR 2500, while the non-package is IDR 6.500 which more expensive.

(a)



Translated to English:
Talkmania package rates
200 minutes = 2.500 (Monday – Friday with usage time are 01.00 – 18.00 local time)

Non-package rates
Known: non-package rates for 60 seconds is 1300, the time which Ani needed to call is 5 minutes or 300 seconds.
Solution:
1.300 x 5 = 6.500 (non-package rates for 5 minutes or 300 seconds). So it's better if Ani call with the talkamnia package because the talkmania package can be used for 200 minutes and the price is cheaper than the non-package price.

(b)

Figure 4: Students' answers to questions about Ani's decision

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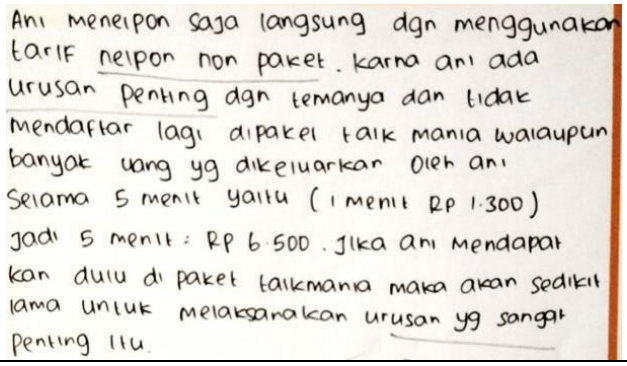
As Figure 4 shows, the students analyzed package and non-package prices and then compared them. They evaluated it by calculating the non-package price for 5 minutes and it can be seen that the non-package price is more expensive than the price for calling with a talkmania package. Then, the students can decide that Ani's choice is right.

In addition, there were students who answered differently from the answers in Figure 4, as shown in Figure 5.



Translated to English:

Ani just called directly using a non-package call rate because Ani had important business with her friend and didn't register for the talkmania package even though Ani spent a lot of money for 5 minutes (1 minute IDR 1.300) so 5 minutes was IDR 6.500. If Ani registers in the talkmania package first, it will take a longer time to carry out that very important business.

Figure 5: Different Students' Answers to the First Question

Based on Figure 5, students answered that Ani should call at a non-package rate because it would save time. In Figure 5, it can be seen the students analyzed the price of package and non-package so that they know the cheaper price for calling is making a call with a talkmania package, it is also seen that the students evaluated Ani's decision by calculating the cost of calling for 5 minutes, but they focused on the sentence "There is an important business right away" which according to the student in Figure 5 that the matter should not be postponed, so students answered the call directly with non-package only with the risk of being more expensive but saving time.

Then, for the second question regarding graphics. Students' answers can be seen in Figure 6.

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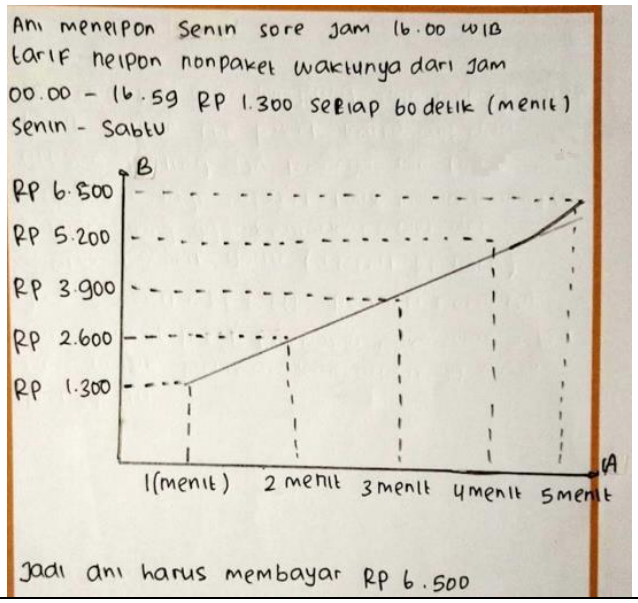
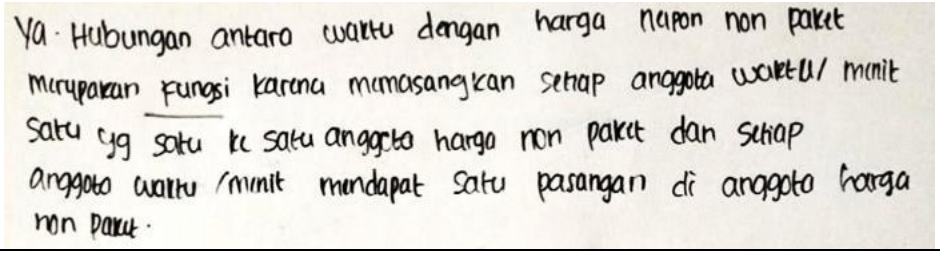


Translated to English:
Ani call at Monday afternoon at 16.00 West Indonesian Time, non-package call rates from 00.00 – 16.59 is IDR 1.300 every 60 seconds.

Figure 6: Student Answers for the Second Question

Based on Figure 6, the students can draw and describe the graph that shows the relationship between the costs incurred when calling with non-package rates and with the length of time calling.

Next is the question of whether the relationship between time and the price of non-packaged calls a function is. The students' answers are shown in Figure 7.



Translate in English:
Yes, the relationship between time and non-package prices is a function because each time member pairs one at a time to a non-packaged price member, the time member gets one pair to a non-packaged price member.

(a)

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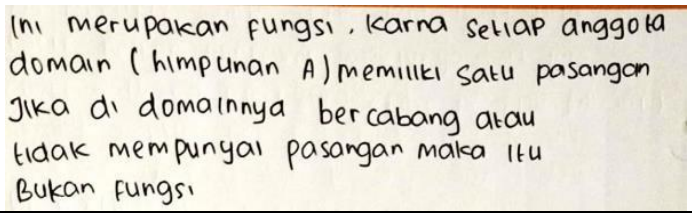

Translate in English:
This is a function because each member of the domain (set A) has one pair. If the domains are forked or have no pairs then it's not a function

(b)

Figure 7: Student Answer for Third Question

Based on Figure 7, the students can determine that the relationship between call time and price is a function. In Figure 7 (b), the students explained the comparison between functions and non-functions. From Figure 7(a) dan 7(b), the students can analyze and evaluate to decide the right answer.

DISCUSSION AND CONCLUSIONS

Akker, et al. (2013) stated that a product is said to be valid if the product developed is based on knowledge or science (content validity) and if the product is consistent with each other or is logical to design (construct validity). Based on the research results, the expert stated that the student worksheet was in accordance with the HOTS level based on the Bloom's taxonomy and the PISA framework. This shows that the student worksheet is valid in terms of content. Then, the expert stated that the student worksheet was in accordance with the 2013 curriculum and that the material chosen was in accordance with the material in class VIII. This shows that the student worksheet is valid in terms of constructs.

Student worksheets are said to be practical if they can be used and are easy to use (Akker, et al., 2013). Based on the development of the prototyping stage from one-to-one to field-tests, students' answers show that they can work on the given student worksheet and are not confused by the questions or information in the student worksheet. This shows that the designed student worksheet is practical.

Students' answers show that the students can relate the information in the table and compare the price of calling with talkmania packages and non-package prices. Then, the students make decisions about which package should be chosen. There are some versions of student answer, there are students who choose the talkmania package as calling with the talkmania package is cheaper than the non-packaged one. However, there is student prefer to call with non-package with the reason that the process is faster, they pay attention to the sentence "there is an important business right away".

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The students' answer corresponds to the description of their ability to analyze and evaluate (Anderson and Krathwohl, 2001; McNeil, 2011; Widana, 2017). Judging from the level in the PISA framework, the students' answer show that they can make models from real situations, make assumptions, are able to interpret tables or available information and relate the information provided in tables and questions in the student worksheet to determine answers. This includes capabilities at level 4 in the PISA framework (OECD, 2018). Then, students are also able to determine which calling package decision should be chosen by including their respective arguments. This includes capabilities at level 5 of the PISA framework.

Then, the students can draw a graph that shows the relationship between calling time and costs incurred. To draw a graph, students analyzed the available information about prices and calling times consisting of days and hours. They evaluated the relationship between calling time and the costs incurred for calling with non-package. Then, the students create a new graph. The student's answer about the graph corresponds to the description of the ability to analyze, evaluate, and create (Anderson and Krathwohl, 2001; McNeil, 2011; Widana, 2017). Based on the level in the PISA framework, the students' ability to analyze to draw graphs is included in level 6 because it is seen that the students can create concepts between the x-axis and y-axis, utilize information, and apply insights to develop new strategies (OECD, 2018). It can be seen in students answer that the students present graphs and can read clear information from the displayed graphs.

The next answer show that students analyzed answers by paying attention to the definition of a function and relating it to the condition of the relationship between non-packet calling time and the cost. Then, the students evaluated it by comparing it with the definition of a non-function. The students' answers about the function correspond to the description of the ability to analyze and evaluate (Anderson and Krathwohl, 2001; McNeil, 2011; Widana, 2017). Based on the PISA framework, the students meet ability levels 4 and 5, because it appears that students can model real situations, determine assumptions, interpret the relationship between calling time and cost, relate existing information, and to decide that the relationship between calling time and non-package calling costs is a function with the correct arguments.

Based on students' answers, the designed student worksheet is able to improve students' HOTS abilities. This is in accordance with the jumping task criteria, namely the task given is challenging and requires the HOTS ability to complete it (Saito, 2015; Hobri, 2016).

Based on the student worksheet development, a valid and practical student worksheet has been produced. The student worksheet is declared valid in terms of content because it is in accordance with level HOTS in taxonomy bloom and PISA framework. The student worksheet is valid in terms of constructs because it is in accordance with the material contained in the 2013 curriculum for eight graders. The student worksheet is also practical which shows that it can be used by students, students understand the purpose of activities or problems in the student worksheet, and support student ability namely HOTS.

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Suggestion for future learning that this student worksheet can be used for classroom learning to train students' HOTS. For further research, it is possible to develop student worksheets with different materials so that more jumping task-based student worksheet are produced.

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