Descriptive analysis of student electronic worksheets based on stem-entrepreneurship integrated group investigation in physics learning

A. Aprilia *, H. Kuswanto, and W. S. Brams Dwandaru

Physics Education Department, Faculty of Mathematics and Natural Sciences, Universitas Negeri Yogyakarta, Indonesia, Jl. Colombo No. 1, Yogyakarta, 55281, Indonesia.

Received 30 September 2024; accepted 12 January 2025

Learning resources and models are needed to support 21st century skills. In this research, we have used electronic worksheets (e-worksheets) based on direct instruction, group investigation, and group investigation - Science Technology Engineering Mathematics and Entrepreneurship. The aim of this research is to qualitatively compare students' e-worksheet answers to students' creative thinking and graphical representation abilities. The method used is the descriptive qualitative method. The results show that the e-worksheets influence students' creative thinking abilities. Group investigation - Science Technology Engineering Mathematics and Entrepreneurship based e-worksheet gives the best creativity from students. The e-worksheets based on direct instruction, group investigation, and group investigation - Science Technology Engineering Mathematics and Entrepreneurship show the same results for the graphical representation ability.

Keywords: e-worksheet; direct instruction; group investigation - science technology engineering mathematics and entrepreneurship; creative thinking ability; graphical representation ability.

DOI: https://doi.org/10.31349/RevMexFisE.23.010206

1. Introduction

Various challenges in the 21st-century give rise to the fact that cooperation is urgently needed, especially in creative entrepreneurship and interpersonal relationships. Cooperative learning is an important and appropriate learning model to meet these various challenges. Through cooperative learning, students have experiences due to differences in opinion, culture, thinking abilities, and cooperation in solving problems so that common goals are achieved [1]. With the cooperative learning model, students can implement cooperation skills at the individual, local, and global levels [2]. On the other hand, entrepreneurship in the 21st century requires teamwork. The ability to work together in a team is very essential because it equips students for the world of work, that is, good cooperation is needed to increase the effectiveness and efficiency of work results [3]. A type of cooperative learning that is often used in learning is group investigation (GI). The GI type is a learning model that focuses on group problem-solving efforts [4]. Research findings on the GI type are effectively used to improve learning outcomes [5-7], scientific attitudes [8], learning activities [9], and creative thinking abilities [10]. The steps involved in using the GI type include selecting a topic, cooperative planning, application, analysis, and presentation.

Science, Technology, Engineering and Mathematics, abbreviated as STEM, is an approach that combines four scientific disciplines in a compact and integrated manner. STEM is a 21s-century learning approach in an effort to produce quality human resources, both from cognitive, psychomotor, and affective aspects [11]. In this case, the STEM approach is integrated with Entrepreneurship to become STEME. STEME is the state of the art in this research, in which further studies are needed so that it can be used in classroom learning. Studies on STEME were conducted by [12,13], which discussed entrepreneurship from a non-business perspective so that there could be synergy between STEM and entrepreneurship in social and economic development in the future. Entrepreneurial competency is one of the important competencies that must be mastered as one of the keys to prepare the young generation who are ready to face the challenges of the 21st-century. The urgency of entrepreneurship education is to provide competencies that are relevant in the 21st-century [14]. Producing human resources who have an entrepreneurial spirit and are supported by the values of strong, honest, creative, and disciplined national characters is the most important thing in entrepreneurship education. Furthermore, in this study, the STEME is integrated into GI, *i.e.*: GI-STEME learning model.

Physics is a subject that is related to the application of various physical concepts that can be found in everyday life. Physics is considered a tough subject because it requires persistence, precision, and a lot of problem-solving practices [15]. Studying physics is important as a means for developing thinking abilities. Students can learn the findings resulting from the application of physics through the learning process in class. However, in the learning process there are obstacles that can hinder the physics learning process. Many students lack logical thinking and solving the problems they face [16]. This is, of course, connected to the low creative thinking ability of students especially in learning physics. Moreover, the physics material in this research is Temperature and Heat. Temperature and Heat material is one of the physics materials that is considered difficult by students [17]. This is supported by the findings of [18] that students experienced difficulties in the Temperature and Heat material.

One of the factors that influence the physics learning process is the ability to think creatively. Creative thinking is the ability to think sharply using intuition and imagination to reveal new ideas or discoveries as a development of old ideas to solve a problem from various points of view [19] and depending on thinking style [20]. The ability to think creatively is influenced by students' ability to accept new material and relate it to existing knowledge [21]. Creative thinking patterns are applied by students in learning to have openness to experience [22], practice solving current or future problems by generating innovation [23], apply the ability to evaluate, and describe and select ideas [24]. It is important to develop creative thinking to help and find alternative solutions to problems and to be equipped to face the challenges of the 21st century [25]. It was found that students' creative thinking abilities in learning physics are still low [26,27]. This is because the learning process is less interesting and students find physics subject difficult. Another initial finding from this study is that the graphical representation ability of students is still low and limited to certain physics material [28]. Apart from that, the learning process is still teacher-centered and there are students who do not pay attention while the teacher explains and are not interested in studying physics. Furthermore, the target school has implemented the concept of entrepreneurship in its extracurricular activities so that it is easy for researchers to provide entrepreneurship material embedded in the physics material.

E-worksheet is a display of information or manuscripts that students use to answer questions and/or complete tasks that are presented electronically using data storage media. E-worksheets provide a fun learning process by prioritizing students' understanding of concepts [29,30]. The presentation form of E-worksheets is arranged in an electronic format, which can contain text, images, and videos [31,32]. The E-worksheet developed in this research contains GI-STEME, GI, and direct instruction (DI) learning models. The objective of this study is to qualitatively compare students' E-worksheet answers based on GI-STEM, GI, and DI learning models toward students' creative thinking and graphical representation skills.

2. Research methodology

The method used in this research was a qualitative descriptive method. Qualitative descriptive was a method that focused on problems based on facts. This included describing, illustrating, and observing phenomena that occur in a real, realistic, actual, systematic, factual, and accurate manner by paying attention to the facts and relationships between the phenomena being observed [33].

This research was conducted at Public Senior High School (SMA Negeri) 5 Yogyakarta on class XI Science students. Two classes with each class consisting of 36 students (72 students in total) were used as the samples for the pre-observation questionnaire. Moreover, six classes with each class consisting of 36 students (216 students in total) were used as the samples for the E-worksheets based on DI, GI, and GI - STEME learning model treatments. Two classes were assigned to work on each of the DI, GI, and GI - STEME based E-worksheet. The E-worksheet based on DI was conducted individually by each student, whereas the two other E-worksheets were done in small groups of students. The classes for each E-worksheet were chosen randomly.

The instrument used in this research was a pre-observation questionnaire for students. The pre-observation questionnaire was based on the obstacles faced by students during the physics learning process. Moreover, another instrument used was the E-worksheet on the topic of Temperature and Heat based on three learning models, i.e.: DI, GI, and GI - STEME. The E-worksheet comprised of eight topics, which can be seen in Table I.

The data analysis in this research used the Milles & Huberman (1992) [34] model through four stages, namely: (1) data collection, (2) data reduction, (3) data presentation, and (4) drawing conclusions. The data analysis was based on learning indicators, which can be observed in Fig. 1.

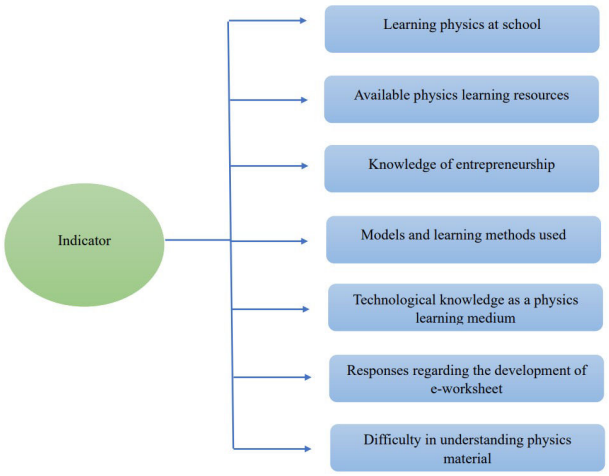


FIGURE 1. Indicators of students' need analysis questionnaire instrument.

TABLE I. E-worksheet topics.

No	Subject of Temperature and Heat	E-worksheet topics
1	Temperature	Magic mug
2	Heat transfer	Canting for batik printing
3	Specific heat and	Thermos
	Heat capacity	(vacuum bottle)
4	Black principle	Batik printing design
5	Latent heat	Porridge cooker
6	Solid expansion	Glass plate
7	Liquid expansion	Thermometer
8	Gas expansion	Air sofa

TABLE II. Findings from the pre-observation questionnaire.

Indicator	Findings
Physics learning in school	Learning physics at school is fun and students are interested in learning physics
Physics learning resources availability	Students rarely read physics books. The physics books that are used as references are not easy to understand and are not related to group investigation activities
Knowledge about entrepreneurship	Learning physics is not related to entrepreneurship. Students like it when learning physics is integrated with entrepreneurship, and are happy if they can produce a product that applies physics concepts
Learning model and method used	Teachers rarely make small groups of students to conduct discussions when students like learning physics in groups. This is because in a discussion ideas and thoughts will emerge
Technological knowledge as physics learning media	Students often use smartphones and/or laptops as supporting tools and enjoy learning physics using learning media
Responses regarding the development of the E-book/E-worksheet	Students need learning resources in the form of E-books/E-woksheets Students are interested if there are E-books/E-woksheets involving group discussions that apply knowledge and skills simultaneously
The difficulty in understanding physics	100% of students find it difficult to understand physics material due to many reasons, namely: i) too many formulas to memorize, ii) the formulas are too complicated, iii) confusing variations of test questions, iv) difficult to focus when learning, v) teachers teach too quickly, v) lack of supporting media, and vi) unpleasant learning.

3. Results

Learning physics is one of the provisions for students to face the 21st century. Physics learning can be more interesting and meaningful if done in groups and collaboratively. In fact, connecting physics with everyday life can be done by adding entrepreneurial aspects to physics learning. This is reflected in the results of the initial observation questionnaire that can be observed in Table II.

This research presents differences in e-worksheets, which are integrated with three learning models, namely: DI, GI, and GI - STEME. The differences between these three models are categorized based on the learning process, activeness, ability to answer, thought patterns, creative thinking abilities, and students' graphic representation abilities which can be observed in Table III. Furthermore, the differences in how to work on the e-worksheets by students, which are arranged based on DI, GI, and GI - STEME can be observed in Table IV. Finally, examples of graphical representation results can be observed in Table V.

4. Discussion

According to most students in Table II, learning physics at school is fun so they are actually interested in studying physics. Students understand that physics is an important part of everyday life. This is what encourages students to study physics. This is helped by technological advances in the field of learning media in the form of laptop and smartphone support tools. Students are already accustomed to using various technological media. This is because SMA N 5 is located in an urban area with sufficient availability of information technology [35,36]. With the abundant availability of information technology, every student has the opportunity to receive the latest information and knowledge in the world. This is what can encourage students to study physics.

On the other hand, it is no longer a secret that physics is one of the subjects that is considered difficult for students. According to pre-observation results, this was triggered by the large number of formulas or equations that needed to be memorized and formulas or equations that were not easy to understand. Apart from that, various variations of Physics questions tend to be confusing and less understandable for students. Not only is it related to physics itself the psychological condition of students who are less focused on studying physics is also a reason. In fact, teachers who teach too quickly, the lack of adequate and enjoyable learning media, and the application of boring learning models are also reasons why it is difficult to understand Physics material. The difficulty of learning Physics according to students seems to be a common phenomenon in the world. The same problem is faced in Nigeria where various mathematical concepts in physics are frightening for students [37]. Furthermore, not only in middle and upper education students as representa-

TABLE III. Differences between DI, GI, and GI - STEME.

Aspect	DI	GI	GI - STEME
Learning process	Teacher-centered learning. E-worksheet is done individually. The method used is lecture.	Learning is centered on students and teachers as facilitators. E-worksheet is carried out in groups with each group of 4-5 students. The method used is scientific discussion.	
Liveliness	Students are relatively passive during learning.	Students actively ask questions and participate during learning by exploring and searching for information independently. Apart from that, each group member actively plays a role.	
Ability to answer	The results are sporadic or undirected, simple and short answers.	The results are directional but less specific answers that include GI steps, namely: planning, investigating and organizing.	The results are focused, scientific, specific answers containing GI steps, and containing STEME elements. Thus, using this learning model there are results of students' product designs along with selling prices as an element of entrepreneurship.
Mindset	Have a simple mindset. Students do not develop and involve creativity.	Have a convergent mindset. Students only focus on existing problems and are objective.	Have a divergent mindset. Students involve creativity, knowledge and skills collaboratively on a problem to obtain further information. In . this way, you can generate many ideas and alternative answers.
Creative thinking ability	Does not involve creative thinking abilities.	Involves creative thinking skills.	Really involves creative thinking skills.
Graphic representation capabilities	The involvement of graphic representation capabilities is the same. There are no significant differences using these three learning models.		

tives of higher education still think that Physics is a difficult subject [38]. Based on this, there is a need for supporting learning resources in the form of e-worksheets as well as the use of appropriate learning models to overcome these various problems.

Based on the results of Table III, it shows that the three learning models differ in the learning process, activeness, ability to answer, thought patterns and creative thinking abilities. This is because the preparation of e-worksheets is tailored to the learning model. Thus, the findings in this research show that e-worksheets influence students' activeness, thought patterns and creative thinking abilities. However, e-worksheets prepared based on DI, GI, and GI - STEME do not affect students' graphic representation abilities. As previously explained, the ability to think creatively is influenced by the learning model implicit in e-worksheets.

Every student has the potential to think creatively. Students' creativity can be developed and expressed during the learning process [39]. Through creative thinking, it enables students to have the ability to find and solve complex problems based on everyday life [40,41].

Findings in the classrooms show that the learning of students applying GI and GI - STEME based e-worksheets is more enjoyable compared to DI based e-worksheets. This is because the e-worksheets based on GI and GI - STEME are done in groups, while the e-worksheets based on DI is done individually. Students' ideas and thoughts emerge when discussing with friends. Through discussion activities, students are encouraged to participate actively, exchange opinions, and debate. However, there are other findings that apply GI-STEME-based e-worksheets is more interesting for students than when they applying GI-based e-worksheets. This is because the GI-STEME learning model provides a more specific and in-depth experience in linking the components of science, technology, engineering, mathematics, and entrepreneurship which are integrated in an atmosphere of group collaboration.

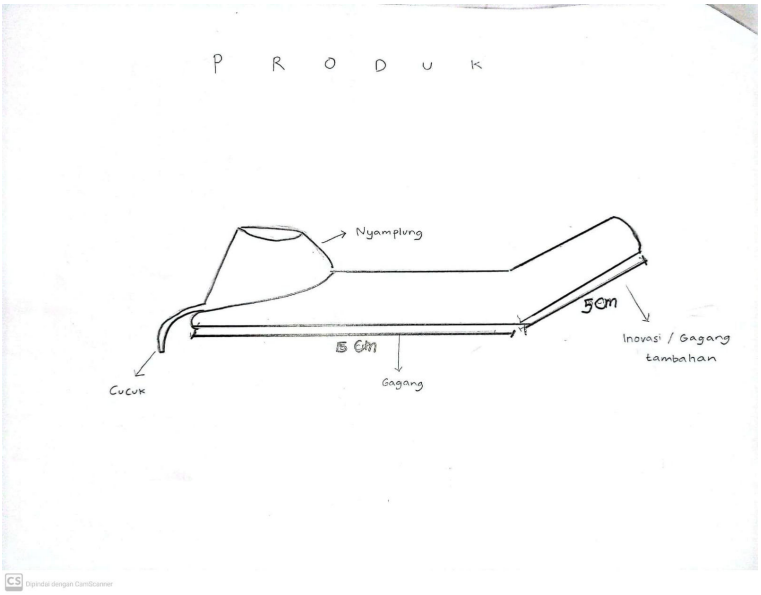
5. Conclusion

This research presents the results of a pre-observation questionnaire and the results of e-worksheets based on the DI, GI, and GI - STEME learning models of class XI MIPA students at SMA Negeri 5 Yogyakarta. Based on the pre-observation results, information was obtained that students still find learning physics difficult. This difficulty is caused by the large number of formulas that must be memorized, difficult to understand, teachers teaching too quickly, lack of supporting

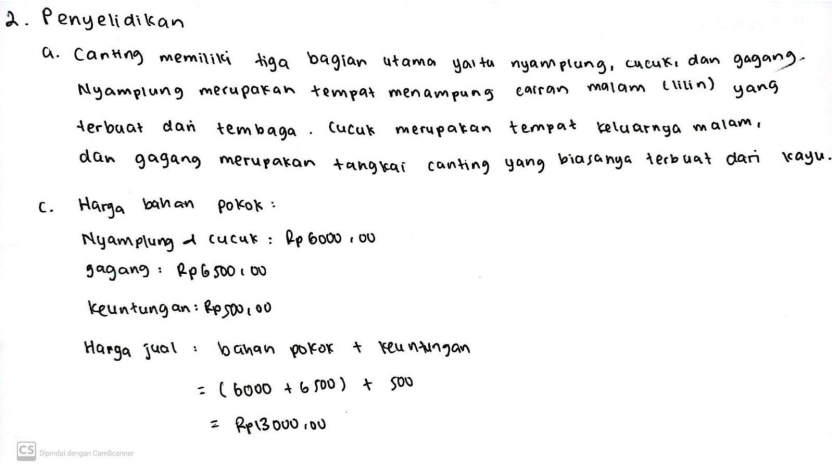
TABLE IV. Results of e-worksheets.

Learning model	Results of e-worksheets
	Topic heat transfer
DI	Cara mengatasi canting yang panas padahal sudah memakai kayu, dimana bahan itu adih isolator. ↳ dengan mengecilkan luas penampang gagang atau memanjangkan gagang canting. hal ini disebabkan karena rumus berikut: $H = k \cdot A \frac{\Delta T}{L}$ dg H = jumlah kalor yg merambat tiap waktu → semakin kecil, panas semakin sedikit. k = koefisien konduksi termal A = luas penampang batang. } yg bisa diubah. L = panjang batang. ΔT = perbedaan suhu antar kedua ujung batang. maka, semakin kecil A, maka panas semakin kecil, karena berbanding lurus. Semakin panjang L, maka panas semakin kecil karena berbanding terbalik. CS Dipindai dengan CamScanner
GI	1. Perencanaan Tentukan batasan penyelidikan, evaluasi sumber daya yang kalian miliki, rancanglah aksi atau tindakan penyelesaian masalah, dan berilah penugasan kepada setiap anggota kelompok: Para penyanyi masih merasakan panas saat memegang canting. Hal ini disebabkan karena bagian depan canting terbuat dari logam (konduktor) dan jarak logam pada tangan berdekatan. ketersediaan SDA kayu di Indonesia sangat melimpah, sehingga untuk menyelesaikan masalah ini, canting dapat dinovasikan dengan ditebalkannya kayu dibagian pegangan atau bisa pula dibalutkan menggunakan kain sebagai pendukung isolator panas. Penentu Batasan Penyelidikan : Mayla Penentu Evaluasi Sumber Daya : Kaka/Ilyas Perencang Aksi/Tindak Penyelesaian : Farrel & Zidan 2. Penyelidikan Lakukan penyelidikan terhadap canting (bagian-bagianya, bahan pembuatnya, dan lain-lain) yang sudah ada di Internet. Analisis dan evaluasi data yang kalian dapatkan. Berilah kesimpulan dari hasil penyelidikan kelompok kalian. canting terdiri dari beberapa bagian, yaitu cucuk sebagai saluran keluarnya malam sekaligus untuk menorehkan malam pada kain, talu nyamplung untuk menampung malam dan gagang sebagai pegangan. perbedaan bahan pembuat canting di beberapa bagian bukan dibuat tanpa fungsi. Bahan aluminium sebagai pembuat cucuk dan nyamplung digunakan agar malam yang ada didalamnya tidak cepat 'set' atau mengeras. sedangkan kayu untuk bagian gagang, bertujuan agar pembatik tidak kepanasan saat mengambil malam yang masih panas. CS Dipindai dengan CamScanner

Learning model	Results of e-worksheets
	Topic heat transfer



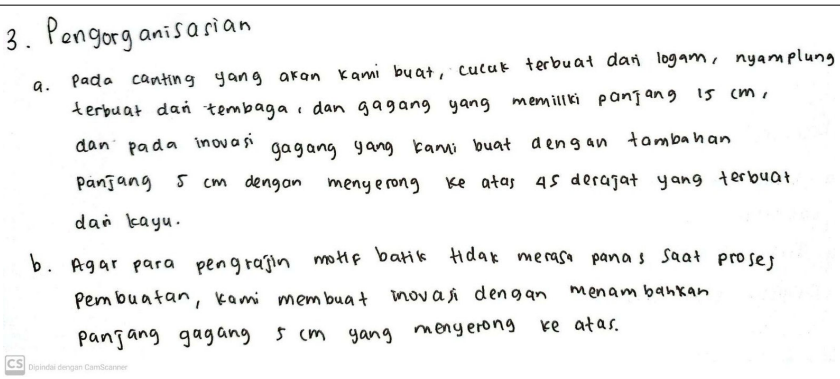
GI-STEME



2. Penyelidikan

a. Canting memiliki tiga bagian utama yaitu nyamplung, cucuk, dan gagang. Nyamplung merupakan tempat menampung cairan malam (lilin) yang terbuat dari tembaga. Cucuk merupakan tempat keluarnya malam, dan gagang merupakan tangkai canting yang biasanya terbuat dari kayu.

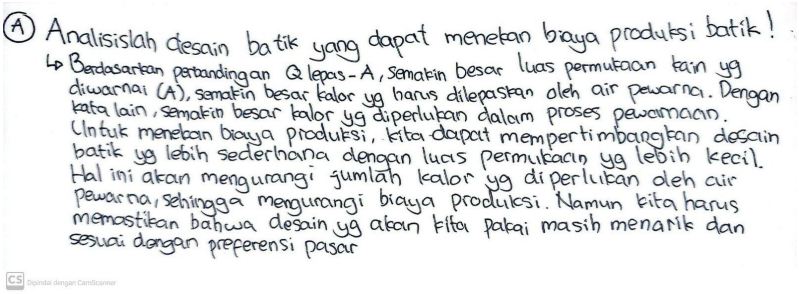
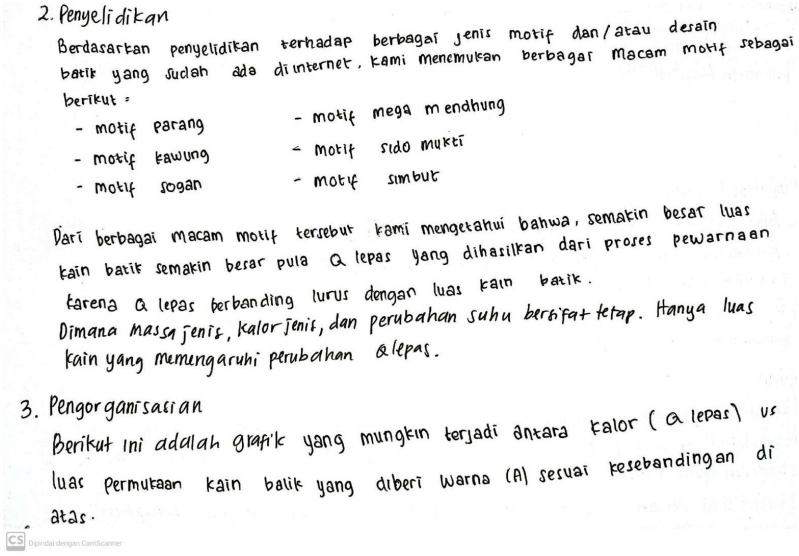
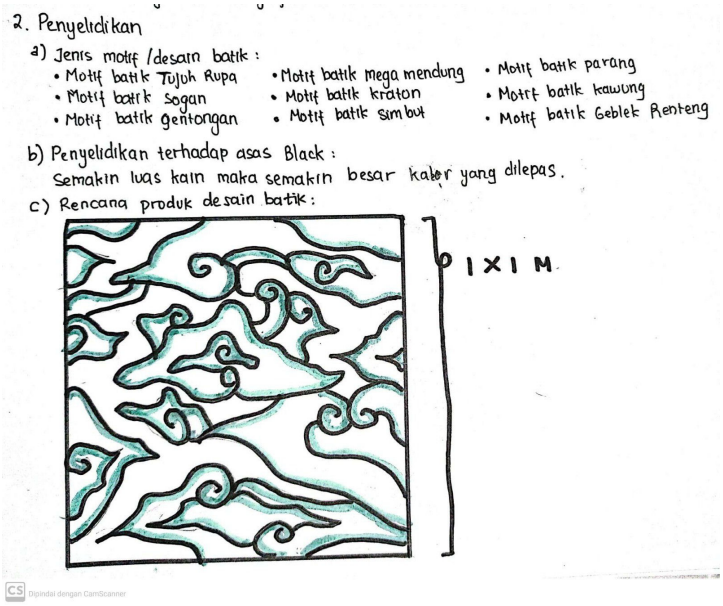
c. Harga bahan pokok :
Nyamplung + cucuk : Rp 6000,00
gagang : Rp 6500,00
keuntungan : Rp 500,00
Harga jual : bahan pokok + keuntungan
= (6000 + 6500) + 500
= Rp 13000,00



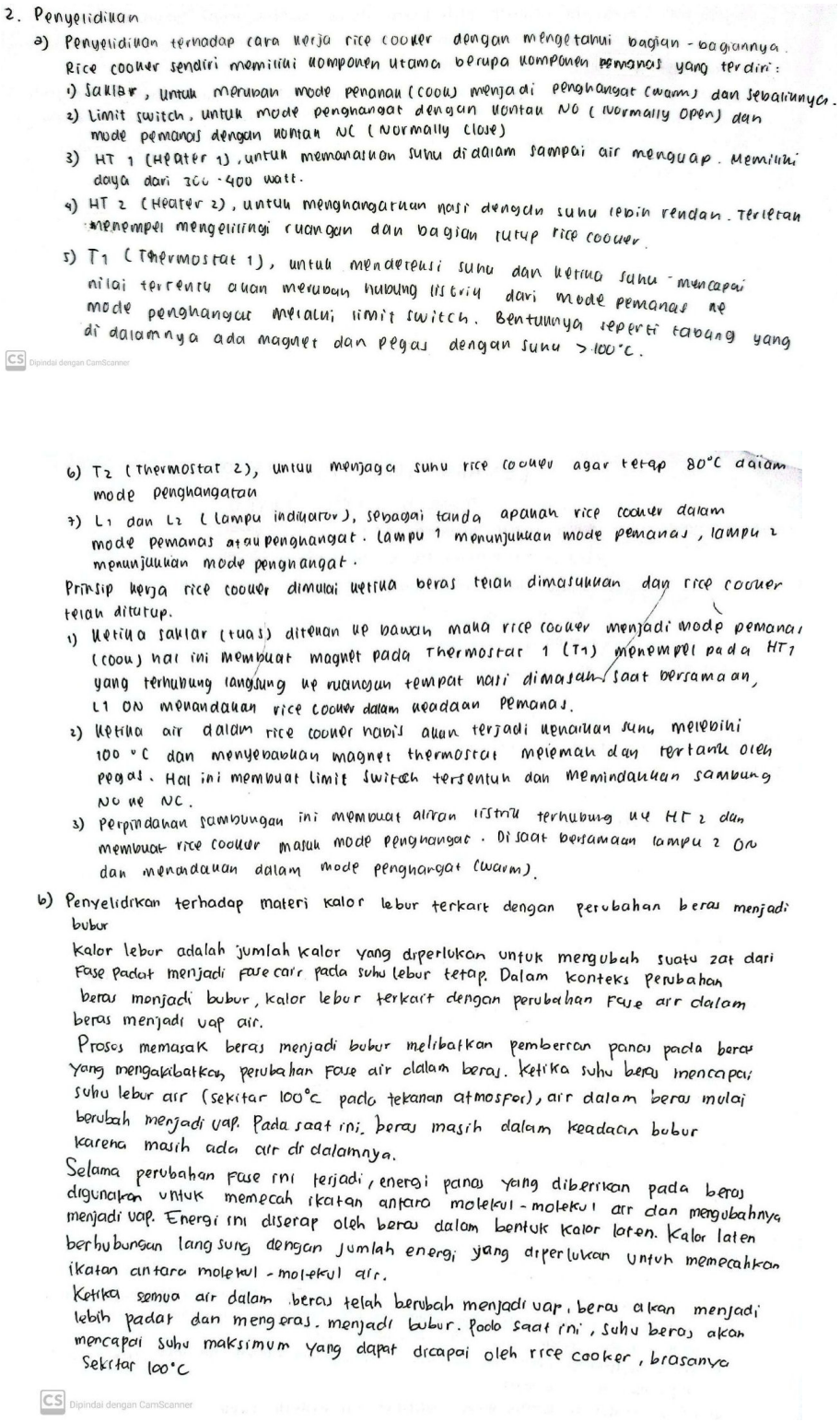
3. Pengorganisasian

a. Pada canting yang akan kami buat, cucuk terbuat dari logam, nyamplung terbuat dari tembaga, dan gagang yang memiliki panjang 15 cm, dan pada inovasi gagang yang kami buat dengan tambahan panjang 5 cm dengan menyerong ke atas 45 derajat yang terbuat dari kayu.

b. Agar para pengrajin motif batik tidak merasa panas saat proses pembuatan, kami membuat inovasi dengan menambahkan panjang gagang 5 cm yang menyerong ke atas.

Learning model	Results of e-worksheets
	Topic black principle
DI	
GI	
GI-STEME	

Learning model	Results of e-worksheets
	Topic black principle
GI-STEME	d) Kisaran harga jual dasain batik : - Kain mori 1×1 → Rp10.000 - Satu set alat batik → Rp65.000 (kompor minyak kecil, wajan, canting) - Pewarna + pengunci (warna biru) → Rp15.000 - Malam → Rp15.000 - Kuas → Rp 5000 - Jasa → Rp20.000 Biaya total → Rp128.000 Harga jual → Rp 170.000 Keuntungan → Rp 42.000 (25 %) 3. a) Alasan kelompok kami membuat kain berukuran 1m × 1m berfungsi agar kalor yang dilepaskan semakin besar. Berdasarkan asas Black diperoleh hubungan antara Q terima dan kalor dilepas oleh air pewarna (Q lepas), yakni : Q lepas = Q terima = ρAcΔT Jika diasumsikan massa jenis kain, kalor jenis kain, kalor jenis pewarna, suhu awal air pewarna, suhu awal kain, dan suhu akhir sistem tetap, maka dapat diperoleh perbandingan, Q lepas ∼ A Yang berarti semakin luar permukaan kain yang tidak diwarnai (tidak terkena malam), maka semakin besar kalor yang harus dilepaskan oleh air pewarna.
DI	Kesimpulan : Jadi kalor laten adalah panas yang diserap oleh suatu benda. Pada kasus Pak Agus yang ingin membuat bubur menggunakan alat, karena beras memiliki kalor lebur yang tetap, maka dengan rumus (Q = m beras × L beras (tetap)) dapat disimpulkan besarnya kalor laten yang dihasilkan / diserap beras berbanding lurus dengan massanya. Jadi semakin banyak massa yang digunakan utk membuat bubur, maka semakin besar juga kalor laten yg dihasilkan atau diserap beras.
GI	Cara kerja rice cooker Pada waktu menanak nasi, saklar akan terhubung dengan elemen pemanas utama, arus listrik langsung menuju ke elemen utama dan lampu rice cooker menyala. Ketika suhu pemanas mencapai maksimal dan nasi sudah matang maka thermostat trip (magnet dari otomatis) langsung menggerakkan tuas sehingga posisi saklar jadi berubah mengalirkan listrik menuju ke elemen penghangat nasi melewati thermostat. Pada posisi penghangat ketika suhu thermostat sudah maksimal arus yang menuju ke elemen penghangat akan terputus otomatis, begitu pula ketika suhu pada thermostat berkurang maka otomatis arus menuju elemen penghangat akan terhubung kembali secara otomatis, proses ini berlangsung secara terus menerus. Materi kalor lebur terkait dengan perubahan beras menjadi bubur. Materi kalor lebur terkait dengan perubahan beras menjadi bubur yaitu kalor laten. Pada materi kalor laten sejumlah kalor yang ditambahkan pada suatu zat akan menyebabkan kenaikan suhu zat tersebut. Jika kalor tersebut terus-menerus ditambahkan kalor, maka suatu ketika zat tersebut akan berubah wujud. Nilai kalor laten zat ini bergantung dari proses perubahan wujud yang terjadi. Saat benda melebur (berubah wujud dari padat menjadi cair), maka kalor laten yang digunakan adalah kalor laten lebur dan biasanya disebut kalor lebur.

Learning model	Results of e-worksheets
	Topic latent heat
GI-STEME	

2. Penyelidikan

a) Penyelidikan terhadap cara kerja rice cooker dengan mengetahui bagian - bagiannya. Rice cooker sendiri memiliki komponen utama berupa komponen pemanas yang terdiri:

1) Saklar, untuk merubah mode penanak (cook) menjadi penghangat (warm) dan sebaliknya.
2) Limit switch, untuk mode penghangat dengan kontak NO (normally open) dan mode pemanas dengan kontak NC (normally close)
3) HT 1 (Heater 1), untuk memanaskan suhu di dalam sampai air menguap. Memiliki daya dari 200 - 400 watt.
4) HT 2 (Heater 2), untuk menghangatkan nasi dengan suhu lebih rendah. Terletak menempel mengelilingi ruangan dan bagian tutup rice cooker.
5) T_1 (Thermostat 1), untuk mendeteksi suhu dan ketika suhu mencapai nilai tertentu akan merubah hubung listrik dari mode pemanas ke mode penghangat melalui limit switch. Bentuknya seperti tabung yang di dalamnya ada magnet dan pegas dengan suhu > 100°C.

6) T_2 (Thermostat 2), untuk menjaga suhu rice cooker agar tetap 80°C dalam mode penghangatan
7) L_1 dan L_2 (Lampu indikator), sebagai tanda apakah rice cooker dalam mode pemanas atau penghangat. Lampu 1 menunjukkan mode pemanas, lampu 2 menunjukkan mode penghangat.

Prinsip kerja rice cooker dimulai ketika beras telah dimasukkan dan rice cooker telah ditutup.

1) Ketika saklar (tuas) ditekan ke bawah maka rice cooker menjadi mode pemanas (cook) hal ini membuat magnet pada thermostat 1 (T_1) menempel pada HT_1 yang terhubung langsung ke ruangan tempat nasi dimasak. Saat bersamaan, L1 ON menandakan rice cooker dalam keadaan pemanas.
2) Ketika air dalam rice cooker habis akan terjadi kenaikan suhu melebihi 100 °C dan menyebabkan magnet thermostat melemah dan tertarik oleh pegas. Hal ini membuat limit switch tersentuh dan memindahkan sambung NO ke NC.
3) Perpindahan sambungan ini membuat aliran listrik terhubung ke HT_2 dan membuat rice cooker masuk mode penghangat. Di saat bersamaan lampu 2 On dan menandakan dalam mode penghangat (warm).

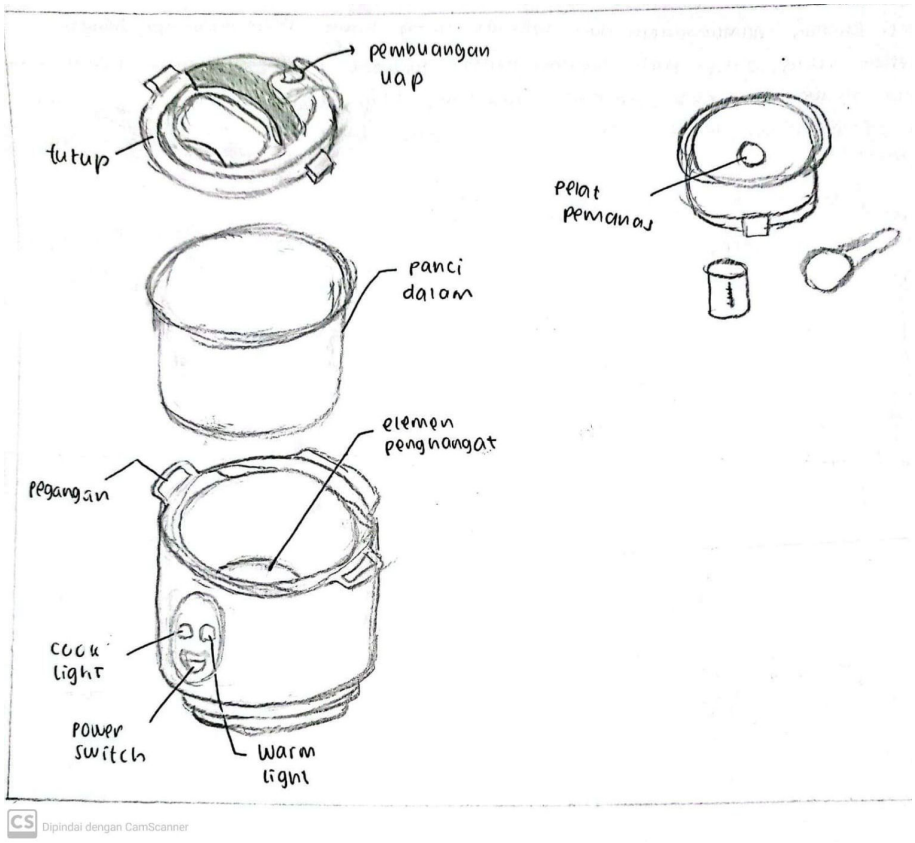
b) Penyelidikan terhadap materi kalor lebur terkait dengan perubahan beras menjadi bubur

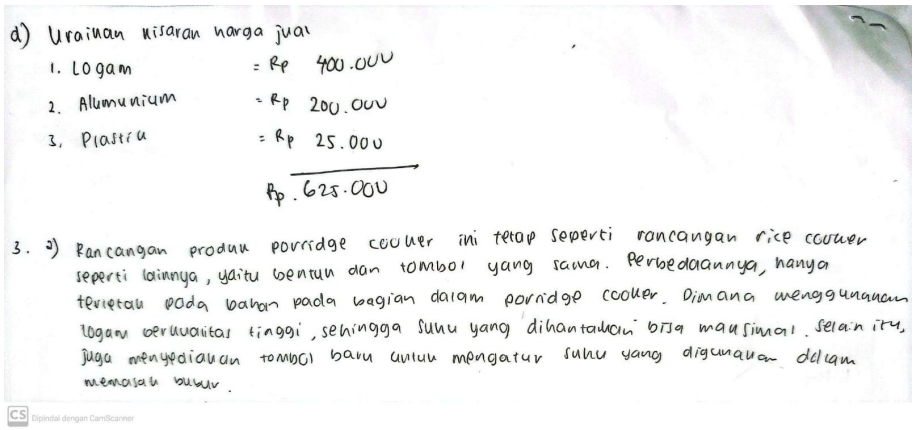
Kalor lebur adalah jumlah kalor yang diperlukan untuk mengubah suatu zat dari Fase padat menjadi fase cair pada suhu lebur tetap. Dalam konteks perubahan beras menjadi bubur, kalor lebur terkait dengan perubahan fase air dalam beras menjadi uap air.

Proses memasak beras menjadi bubur melibatkan pemberian panas pada beras yang mengakibatkan perubahan fase air dalam beras. Ketika suhu beras mencapai suhu lebur air (sekitar 100°C pada tekanan atmosfer), air dalam beras mulai berubah menjadi uap. Pada saat ini, beras masih dalam keadaan bubur karena masih ada air di dalamnya.

Selama perubahan fase ini terjadi, energi panas yang diberikan pada beras digunakan untuk memecah ikatan antara molekul - molekul air dan mengubahnya menjadi uap. Energi ini diserap oleh beras dalam bentuk kalor laten. Kalor laten berhubungan langsung dengan jumlah energi yang diperlukan untuk memecahkan ikatan antara molekul - molekul air.

Ketika semua air dalam beras telah berubah menjadi uap, beras akan menjadi lebih padat dan mengeras. menjadi bubur. Pada saat ini, suhu beras akan mencapai suhu maksimum yang dapat dicapai oleh rice cooker, biasanya sekitar 100°C

Learning model	Results of e-worksheets
	Topic latent heat
GI-STEME	



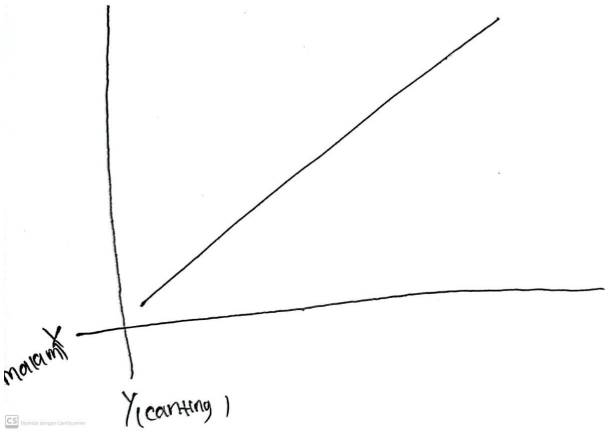
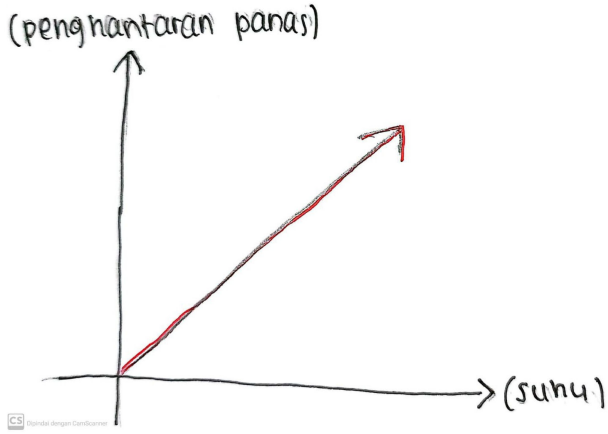
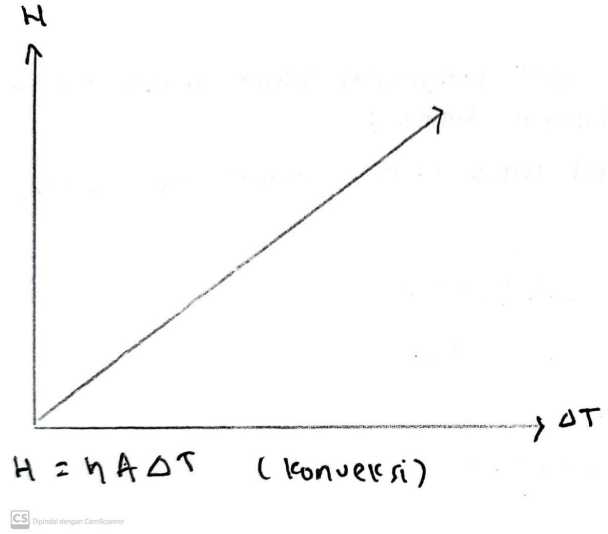
d) Uraian kisaran harga jual

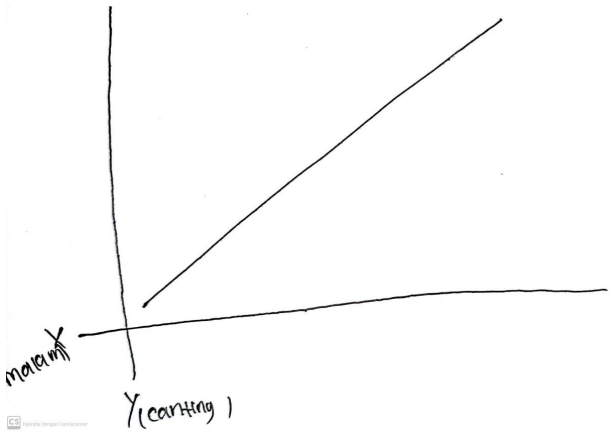
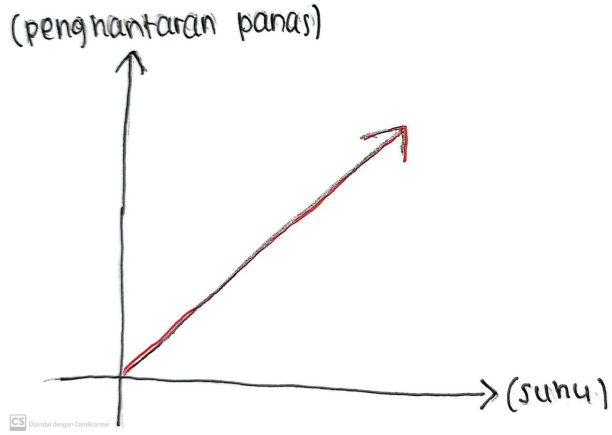
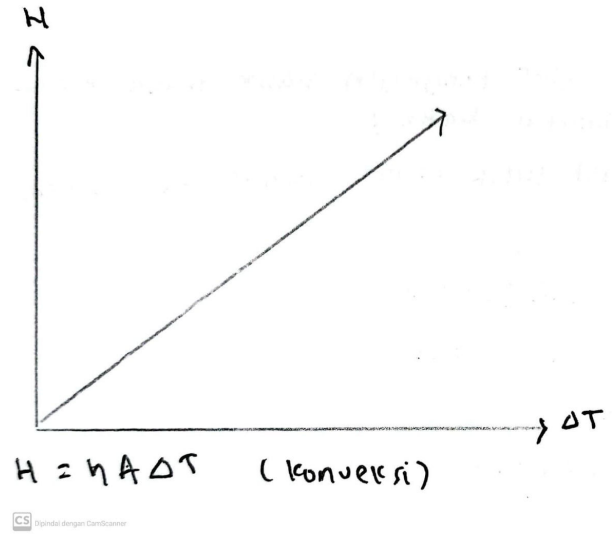
1. Logam = Rp 400.000
2. Alumunium = Rp 200.000
3. Plastik = Rp 25.000

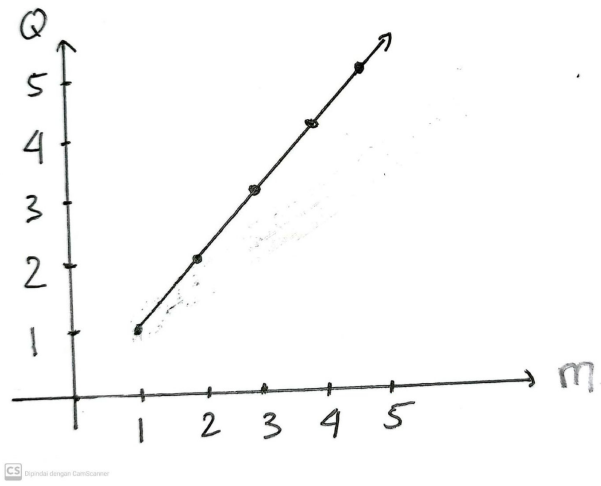
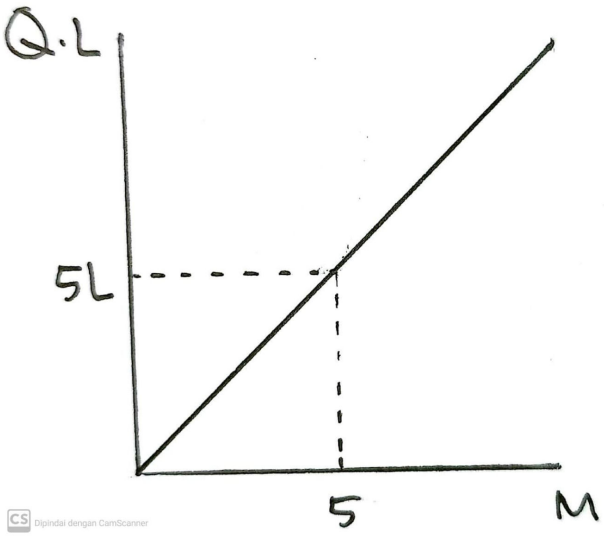
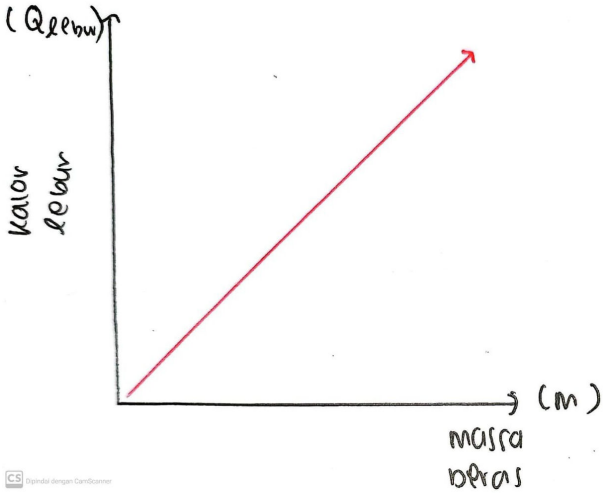
Rp. 625.000

3. a) Rancangan produk porridge cooker ini tetap seperti rancangan rice cooker seperti lainnya, yaitu bentuk dan tombol yang sama. Perbedaannya, hanya terletak pada bahan pada bagian dalam porridge cooker. Dimana menggunakan logam berkualitas tinggi, sehingga suhu yang dihantarkan bisa maksimal. Selain itu, juga menyediakan tombol baru untuk mengatur suhu yang digunakan dalam memasak bubur.

TABLE V. Results of graphical representation of students.

Learning model	Graphical representation results
	Topic heat transfer
DI	
GI	
GI-STEME	

Learning model	Graphical representation results
	Topic black principle
DI	
GI	
GI-STEME	

Learning model	Graphical representation results
	Topic latent heat
DI	
GI	
GI-STEME	

media, and learning that is not fun. Therefore, learning resources and learning models are needed that can overcome these problems. These learning resources and learning models are also needed to prepare students to face the 21st century. The learning model that is considered appropriate for preparing students for collaboration and at the same time entrepreneurship is GI - STEME. This is evident from the results of the e-worksheets work which shows that students tend to think more creatively compared to using the DI and GI learning models. In general, e-worksheets with certain learning models influence students' creative thinking abilities. DI-based e-worksheets work does not bring out students' creativity and only shows a simple mindset. GI-based e-worksheets can bring out students' creativity by showing a convergent mindset. Meanwhile, GI - STEME based e-worksheets brings out the best creativity from students by showing a divergent mindset. On the other hand, graphic representation capabilities are not influenced by the learning model. The results of e-worksheets work related to graphic representation capabilities show the same results for e-worksheets based on DI, GI, and GI - STEME. It can be seen that the e-worksheets work using the DI model is relatively the same. This can be interpreted as saying that the mindset of students using the DI model is simple and does not develop and involve creativity in accordance with Table III. Working on e-worksheets using the GI model shows a more complex way of working but only focuses on existing problems. Meanwhile, working on e-worksheets using the GI - STEME model shows a more in-depth and specific way of working. This is because the model is assisted by STEME syntax which includes Science, Technology, Engineering, Mathematics, and Entrepreneurship. As shown in Table IV, in the GI - STEME model, students design a product design and write down the selling price range. On the other hand, there is no significant difference in the graphic representation abilities of students using the three learning models DI, GI, and GI - STEME. Thus, it can be interpreted that students are able to create and connect mathematical equations into a graph using the DI, GI, and GI - STEME learning models.

Acknowledgements

The authors would like to thank the Indonesia Ministry of Education, Culture, Research, and Technology for funding this study through the DRTPM 2023 Scheme under the contract number 146/E5/PG.02.00.PL/2023.

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