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*by* Nurina Ayuningtyas

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## The impact of interactive online learning by Pear Deck during COVID-19 pandemic era

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## The impact of interactive online learning by Pear Deck during COVID-19 pandemic era

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**Abstract.** The COVID-19 pandemic surprises the world, switches every learning activity to online learning and increases online education platforms' demand. However, teachers must be careful in choosing online education platforms as some online learning applications may look exciting but not give meaningful learning for students. This study uses the Pear Deck to build meaningful learning by establishing the interaction in a mindful activity. As an add-on application of PowerPoint or Google slides, Pear Deck is one solution for teachers to engage students in active and meaningful learning even though the learning mode is changed online. The participants of this study are 20 students from Linear Algebra class. After the class is over, the researcher distributes the questionnaire adopted from the Triple E Framework to assess online learning effectiveness. More than 75% of students responded that teaching and learning by using Pear Deck not only built the interaction as well as the engagement between teachers and students but also allowed them to enhance their knowledge and extend their knowledge through the learning activities. Finally, this research suggests that using the Pear Deck should be followed by the flexible type problem to enhance the higher-order thinking skill.

### 1. Introduction

Almost everything in this world is shut down due to a coronavirus outbreak. Schools cannot operate as usual and switched to be home learning based on government regulation [1]. Many surveys have been conducted related to the effectiveness of online learning. One of them is the surveys conducted by the Ministry of Education of Indonesia. It states that less than 35% of students doing interactive online learning with their teachers. During the online mode, many teaching practices in Indonesia tend to only give tasks and modules without explanation [2–4]. Furthermore, teachers find it hard to build engagement during online learning as teachers worry if turning on the camera will negatively impact the students' internet connection, as accessibility is one of the significant problems in implementing online learning in Indonesia [3].

Before the pandemic, online learning has been adopted by many educational institutions, and the study found that interaction was a challenge for online learning [5]. Surprisingly, the challenge is still happening now, especially for students exposed to online learning. They have not adapted to how to communicate with each other and communicate with their teacher. Furthermore, students are involved in online learning, yet they do not feel enthusiastic about joining it [3]. If this trend continues, the lack of interaction between students and teachers will cause a decline in students' achievement results, negatively affecting students' academic interests and performance. [6].



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Some strategies are introduced to promote participation and interaction among students and teachers, such as using live chat, threaded discussion, or blog [5]. While in the classroom, the worksheet is one alternative to increase students' engagement [7]. Teachers can provide a formative assessment with a worksheet to monitor the students' learning progress and give intervention as needed. However, those strategies as mentioned earlier, would work well if combined with the teachers' prompt response and feedback [8]. Giving real-time feedback is always beneficial in ensuring the students have a correct understanding of the material. However, giving real-time feedback while teaching is challenging [9], especially when many students are involved. With the changing mode of instruction, the challenge becomes more significant as it needs such a platform that enables students to respond. Teachers can see students' real-time progress and give real-time responses. Even teachers can visualize the students' responses to the class and bring them into the discussion.

According to the world bank report about Indonesia's current education profile, educational technology is highly demanded, especially during the pandemic [10]. However, choosing the proper technology is not as easy as the wrong choice will lead to false engagement [11]. During this pandemic, many teachers should be exposed to the platform that enables teachers and students to interact actively and lead to active teaching and learning. This study then introduces the use of Pear Deck in online learning to promote interactive learning. This is one of the tools that can build interactivity by using slides as the media. Teachers can also get valuable insight by receiving students' responses and giving real-time feedback [12]. This study will then use Pear Deck and examine its effectiveness in the teaching and learning process. The tools will be assessed according to engagement level and see whether it allows students to enhance and extend their knowledge of concepts.

## 2. Literature review

Every student learns on a different path, and some students can work independently; others need more guidance. It is not easy to keep every single student focus on the teaching-learning process. Interactive learning is needed to keep students paying attention and understanding what lecturers deliver. There must be interaction in terms of giving and take between students and teachers [13]. Sometimes, it is shown by having students respond and take action in any teacher's instruction.

Interactive learning could be mean as an ability to interacting and learning by way of conversation, dialogue, or action. Thus, we could term "interactive," a method whereby the learner is viewed as a participant expected to perform specific actions [14]. Students act as listeners or observers but take an active part in the teaching-learning process and appear to be a driving force behind it all happening [14]. Interactive learning tasks provide students with the interaction between a system and a person while learning task processing [15]. This interaction supports students in performing the needs series of cognitive operations and actions by (a) provide them opportunities for repetition and correction, (b) tutoring learning task processing, for example, break down the problem-solving process into subtasks or delivering hints for it and (c) simultaneously giving students feedback.

Nowadays, due to COVID-19, every teaching and learning activity is switched to be online. Online learning is defined as a process associating digitally-enabled reciprocal action between a teacher or lecturer, or designer and a student [16]. Online learning requires access to content, tasks, and problems by at least one human being (a learner) using digital technology, for example, a gadget with internet access. There are three categories of online learning environments: fully web-based learning, blended learning, and traditional courses using web-based supplements [17]. Because of the spread of COVID-19, many lecturers must have switched to fully web-based learning. Fully web-based learning is organized entirely on the internet with no face-to-face interaction, all aspects of the course being delivered in an online learning environment.

However, online learning brings some problems for lecturers and students. The lecturer has difficulties keeping students engaged during online learning without a lecturer's presence and face-to-face contact. Lack of internet connections for students living in rural and marginalized communities is a big problem in Indonesia [2]. Students who have only access the internet through smartphones since they do not have

laptops and PC have a problem not taking advantage of online learning because a significant amount of online content is not accessible via smartphones.

Educators such as lecturers and teachers need learning applications to interact with teachers or lecturers to solve those problems. There are some tools and strategies to delivering interactive online learning and student engagement, including using a group, debates, and assigning different roles to students in discussions. Pear-Deck is one of the applications that work well on smartphones, tablets, laptops, and PCs. Pear-Deck is an add-on that allows importing Microsoft PowerPoint slides and Google slides to create new educational material in slides. Pear-Deck allows the user to create exciting questions to focus on the fascinating facts at the center of studies.

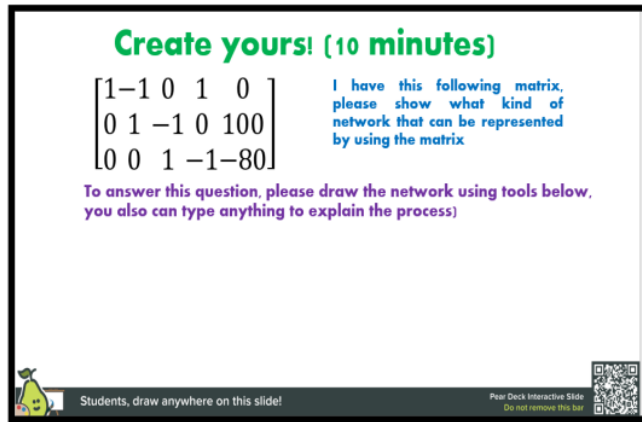
Other research notes that Pear-Deck makes it easy for users to ask curious and intuition-challenging questions instead of just conveying facts, letting students become self-motivated and active learners [18]. Students sometimes feel worried whenever they need to answer the questions in the class. Pear-Deck helps the lecturer ask open-ended questions, engage with every student's answers, and discuss the students' responses. While lecturers using Pear-Deck in online teaching-learning activities, it provides every student with interactive online activity on their screen. Pear Deck allows only a lecturer to see all students' responses and allows the teacher to show the response anonymously. This way will give immense self-confidence to the students and encourages them to participate actively. Active participation of students will provoke discussion on online learning by using Pear-Deck. Online discussion is used to increase students' understanding and help them interact between their friends and teachers [19]. Another research also proved that discussions help support student engagement, develop critical thinking skills, improve communication skills, and enhance students' learning [13]. It is the essential to evaluate interactive online learning by using Pear-Deck. This research then evaluates the use of online tools and specifically Pear-Deck, for improved students' performance through active learning.

### 3. Methods

The participant of this research is 20 students from Linear Algebra Class. This study is started by developing learning material delivered in online mode interactively. The teacher can see the students' responses in real-time and give them valuable insight and feedback accordingly. The researcher uses the Pear Deck as an add-on to be added in PowerPoint slides or Google slides. After four meetings, the researcher then distributed the questionnaire of 3 scales: Yes, Maybe, No, where the questions are adapted from the Triple E framework to assess the effectiveness of using Pear Deck in the online classroom activities. The details of the research method will be explained as follow.

#### 3.1. Developing material using pear deck

In this step, the lecturer uses PowerPoint slides or Google slides consisting of explanation, recalling activity, and comprehension checking activity. When coming to the questions, the teacher used open-ended questions to develop their flexibility [20]. The teacher creates a slide, then adds a Pear Deck add-on to create the interactive slides. Figure 1 is the slide examples:



**Figure 1.** Pear deck interactive slides in linear algebra class.

According to the slide depicted in figure 1, students can draw the network in that slide directly, and the teacher/lecturer can see the response and show the response to the class for further discussion. The teacher will deliver the material using Pear Deck and deliver it online with a video conference for four meetings.

### 3.2. Data collection

After four meetings, students will receive the questionnaire, which examines the Pear Deck's use during teaching and learning activities. The questionnaire consists of 9 questions, where the questions are adapted from the Triple E framework [21]. This questionnaire will also assess the level of engagement, enhancement, and the extension of the material using a technological tool: Pear Deck. Furthermore, all responses during four-week-teaching and learning activities using Pear Deck will be stored in the researcher's Google drive to be analyzed further.

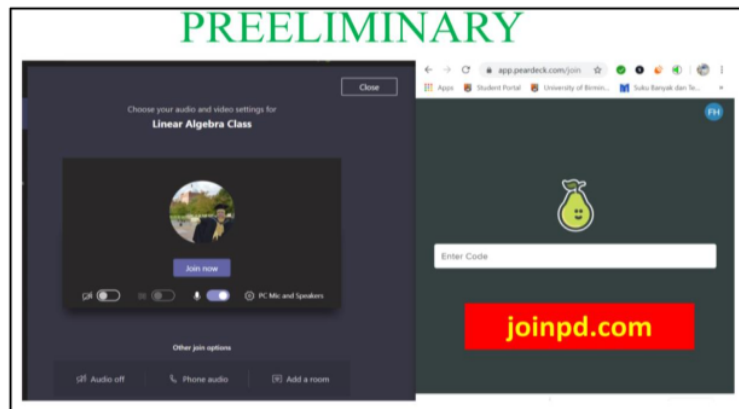
### 3.3. Data analysis

The questionnaire results during teaching and learning will be analyzed based on the Triple E framework using percentage–descriptive statistics. The results will also be supported descriptively by the response in slides used for teaching and learning activities, and it will be coded according to the Triple E framework components.

## 4. Result and discussion

### 4.1. Teaching and learning process

Teachers conduct the learning process in both synchronous and asynchronous modes. In synchronous mode, the teacher will use conference meetings combined with the use of Pear Deck. Teachers will share the screen to show the projector preview of Pear Deck and use the second device (in this case is a mobile phone) to open the teacher dashboard where the teacher can access the detail like the name of students who have responded and who have not responded yet. Before the learning process, the teacher will ask students to ensure they have access to open both the conference meeting (so that they can hear the teacher's voice) and Pear Deck slides. If they are using laptops, the teacher asked students to divide the laptop window preview into two, one for a conference meeting and another for their browser opening Pear Deck slides, as depicted in figure 2.



**Figure 2.** Dividing the window preview.

The conference meeting preview depicted in figure 2 left side informs them about the joining code into Pear Deck slides and their friends' responses when the teacher chose several interesting answers to be discussed further in the class. Please note that the Pear Deck system will not share students' names through projector view. The system only shares the answer or response. It effectively minimizes students' anxiety to respond to the teacher's prompt due to the public's shown identity [22]. However, due to the accessibility issue [2], students may only have a mobile phone to access it, so that to avoid miscommunication, teachers will emphasize these statements:

1. "Ok, guys, now please look at your Pear Deck slides and work on it."
2. "Ok, it is time for discussion. To see the response of your friends, please go back to your conference meeting."

#### 4.2. The result of triple E framework survey

Table 1 shows the survey result of 20 participants who took linear Algebra this fall semester. The survey adopted from the triple e framework [21] is given after the four-week meeting by using Pear Deck as the media.

**Table 1.** Survey result.

Questions	0 = No	1 = Somewhat	2 = yes	Average score
A. Engagement in the learning				
The technology allows you (students) to focus on the assignment or activity with less distraction (A1)	0%	16%	84%	1.84
The technology motivates you to start the learning process (A2)	4%	36%	60%	1.56
The technology causes a shift in your behavior, where you move from pas 20 to active social learners (A3)	8%	12%	80%	1.72
B. Enhancement of the learning				
The technology tool allows you to develop a more sophisticated understanding of the learning goals or	4%	16%	80%	1.76

content (higher-order thinking skills)

7.1)

The technology creates paths for you to demonstrate your understanding of the learning goals so that they could not do with traditional tools. (B2)

16%

12%

72%

1.56

The technology creates a scaffold to make you easier to understand concepts (B3)

12%

24%

64%

1.52

5) Extension of the learning goal

The technology creates opportunities for you to learn outside of your typical school day. (C1)

14.3%

42.9%

42.9%

1.3

The technology creates a bridge between your school learning and your everyday experiences. (C2)

14.3%

57.1%

28.6%

1.14

The technology allows you to develop skills that they can use in their everyday lives (C3)

0%

42.1%

57.1%

1.5

Total Score

13.9

According to [21], this score of 13.9 (see table 1) shows an exceptional connection between tools and learning objectives. When the lesson gets a score of at least 13, it meets all the three components from the Triple E framework: Engagement, Enhancement, and Extension. The technology used (Pear Deck) can engage students to be active learners throughout the lesson period by responding to every teacher's prompt. The Pear Deck can also make the students understand the concept better and build better enhancement by exploration and analysis where they cannot do it by only listening to the teacher's explanation [7]. Finally, Pear Deck allows students to extend their learning experience by connecting it to daily life activities. The survey result will be analyzed deeper by looking at every criterion combined with the slides used for teaching and learning activities.

4.2.1. *Engagement.* Students found that Pear Deck engaged students to be more participative in this criterion, as Pear Deck changed students' passive behavior to be active social learners (84% agree on A3). It is because the Pear Deck platform will inform us, teachers, about students who have responded to our task/question/prompt and who have not responded yet in our teacher dashboard in real-time, as shown in figure 3.

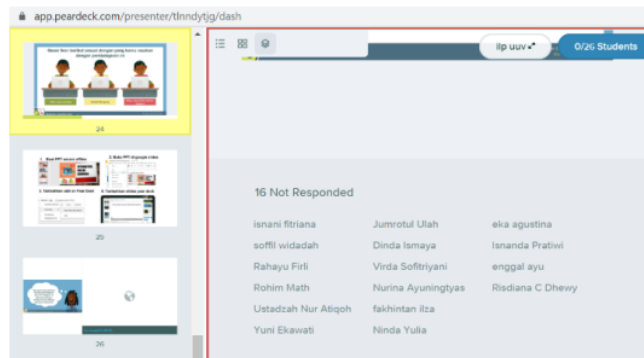


Figure 3. Teacher dashboard preview of not responding students information.



For students who have not responded to the prompt, the teacher will ask through conference meetings why particular students have not responded yet. Sometimes, it is because of the internet issue. This confirmation will also alert students to always active and respond immediately to every prompt given by the teacher.

Once students enter the Pear Deck slides, students will be locked into the system and cannot go outside the system unless the teacher asked to do so. If they are leaving, the teacher dashboard will inform teachers that some of their students are missing. Teachers can confirm it through other communication media.

The students will work on the learning activity through the slides that have been integrated with Pear Deck. It is because the slides will contain the information, instruction, as well as assessment. Sometimes students will be required to access another platform/website, yet students do not need to leave the Pear Deck as the system will embed the website into the Pear Deck slides. The following example depicted in figure 4 is when students are being asked to open Desmos graphing calculator in understanding the linear function graph. When they are clicking Answer Question, they will be redirected to the website required by teachers. It also justifies A1 in table 1 (84% agree), when students focus on the learning process without opening unrequired websites.

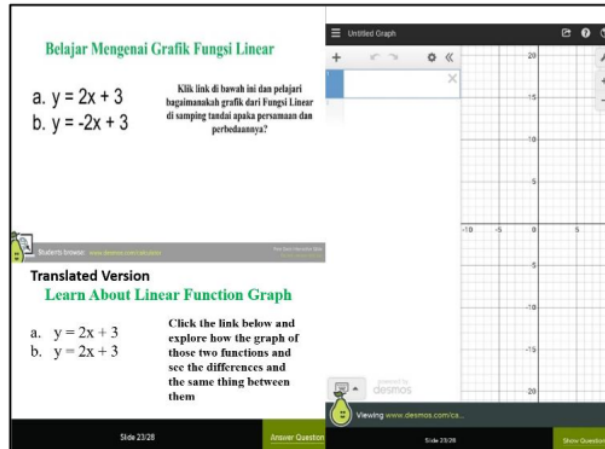


Figure 4. Students preview of the embedded website.

Pear Deck introduces the way of communication, motivating students to join right away after the teacher shares the joining code. It took less than 5 minutes for students to gather in the Pear Deck platform altogether. Pear Deck's interactivity motivates students to engage with the activity as Pear Deck gives the new feeling of working on a hands-on activity usually done in the class (only 4% did not agree on this A2 - see table 1). Pear Deck also ensures the interactivity component happens during working with the platform as students will continuously be tracked to always remain in the platform and engage with the prompt [14].

**4.2.2. Enhancement.** The enhancement criterion mainly discussed about the comprehension of students related to the material. The B1 criterion states that 80% of students agree that Pear Deck allows them to understand the material more. This tool allows them to practice the analysis skill during the discussion. The teacher's developed material shows that some problems require students to do analysis skills. Analysis skill itself is the skill that is required to achieve higher-order thinking competence.

Furthermore, higher-order thinking competence can be achieved through the routine practice of discussion during the learning process [23]. Pear Deck facilitates the discussion by allowing teachers to

show the students' responses (all responses or the selected one) to the projector preview so that other students can see them. The purpose of the teacher showing it to lead to further discussion. The teacher will ask students to respond to the questions: "What do you think of this answer? Is it correct or not? Please provide your reason!". Students will be required to turn on the microphone to respond to the teacher's question during the synchronous session. Figure 5 shows the problem used in Pear Deck implementation, which requires analysis. Then, figure 6 reveals the students' responses about the problem.

**MATLAB problem 2**

[M] Let

$$S = \begin{bmatrix} 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

Compute  $S^k$  for  $k = 2, \dots, 6$ .

Question

What characteristic do you see after you do the calculation

Students, write your response! Pear Deck Interactive Slide

**Figure 5.** The problem which requires analysis skill.

xxl qke

- the diagonal of 1 disappear.
- as the power of S increases, the diagonal of 1 will go to the upper diagonal.
- I can compute the  $S^k$  just to the diagonal entries
- A 5x5 zero matrix
- everything back to zero when I type  $S^6$
- as the power of S increase, the diagonal of 1 is shifted to the right
- for  $s^5$  and  $S^6$  is equal to zero matrix

**Figure 6.** Students responses for MATLAB problem 2.

Flexibility in thinking also contributes to higher-order thinking competence [20]. The teacher's designed material is mostly about open-ended problems, where students will have answer variation. The sample of the problem is depicted in figure 7. Pear Deck facilitates students to answer the prompt by having an elevated way in the paper-based worksheet. Students will be provided with colorful stationery and tools for typing text, deleting text, or undoing the action. Therefore, students feel facilitated to produce more comprehensive answers as they cannot do it in paper-based worksheets (72% of students agree on B2 in table 1). Furthermore, it implies also that students are enjoying the independence to analyze the problem and expressing the result of analysis with Pear Deck, which leads to interactivity [14].

**Create yours! (10 minutes)**

$$\begin{bmatrix} 1 & -1 & 0 & 1 & 0 \\ 0 & 1 & -1 & 0 & 100 \\ 0 & 0 & 1 & -1 & -80 \end{bmatrix}$$

I have this following matrix, please show what kind of network that can be represented by using the matrix.

To answer this question, please draw the network using tools below, you also can type anything to explain the process)

Students, draw anywhere on this slide!

Peer Deck Interactive Whiteboard

The screenshot shows a Pear Deck slide with a math problem. At the top, it says "Create yours! (10 minutes)". Below that is a 3x5 matrix:  $\begin{bmatrix} 1 & -1 & 0 & 1 & 0 \\ 0 & 1 & -1 & 0 & 100 \\ 0 & 0 & 1 & -1 & -80 \end{bmatrix}$ . The text asks the student to show what kind of network can be represented by the matrix. Below the text is a drawing area with a toolbar containing icons for Pencil, Highlighter, Line, Text, and Eraser. A QR code is visible in the top right corner of the slide.

**Figure 7.** The sample of flexibility – problem.

Pear Deck also facilitates the teacher to analyze the result of students' work efficiently. Pear Deck provides students' responses that can be shown as a grid, as depicted in figure 8. In the paper-based worksheet, time constraints limit teachers' ability to provide immediate and real-time feedback [9].

The screenshot shows a grid of six student responses to the problem shown in Figure 7. Each response is a small version of the slide, showing the student's drawing and any text they entered. The responses are arranged in two rows of three. The top row shows three different network diagrams drawn on the matrix. The bottom row shows three more network diagrams, some with additional text explanations. The grid is titled "SYSTEMS OF LINEAR EQUATION" and "cch gph".

**Figure 8.** Grid preview of students' responses.

Using a teacher dashboard enables the teacher to see the students' responses quickly, and teachers can also give valuable feedback in real-time. Feedback also serves as the scaffold for students to keep them on track with the learning objective and avoid misconceptions [9].

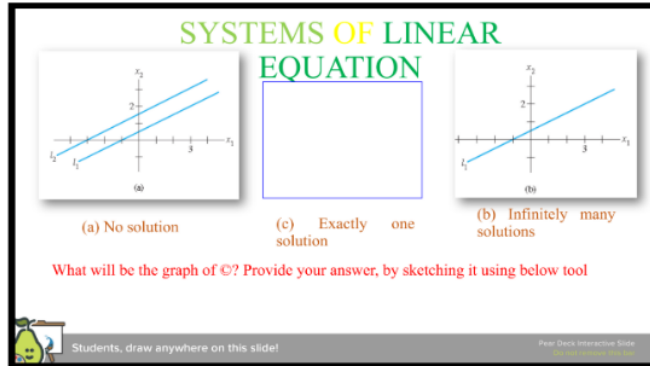


Figure 9. A scaffold as series of hints.

The scaffold is also given at the slides through the series of hints, such as depicted in figure 9, where students need to use their analytical skills to see the linear equation system graph's highlighted feature. Considering Pear Deck's way provides access to the scaffold, 64% of students agree with the B3 statement (based on table 1).

4.2.3. *Extension.* The learning should take place not only in the school but beyond that. The extension provides us with the understanding that learning is 24 hours and that teachers should provide the resource or needed material to support learning in 24 hours. One of the extension criteria (C1) states that 42.9% agree (see table 1) that learning can take place 24 hours using Pear Deck as they are exposed to asynchronous Pear Deck when student pace mode is activated (see figure 11). The instruction of teachers is recorded and put through every slide. Other 42.9 % (see table 1 – C1) said they are unsure whether Pear Deck gives access to them out of the school as they do not experience the student-paced mode.

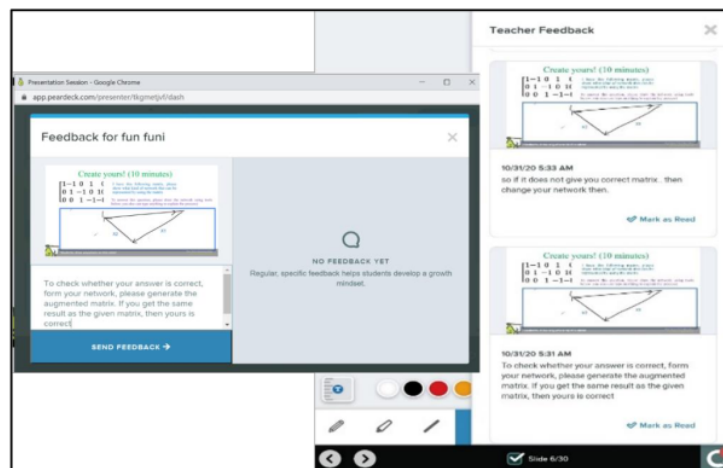
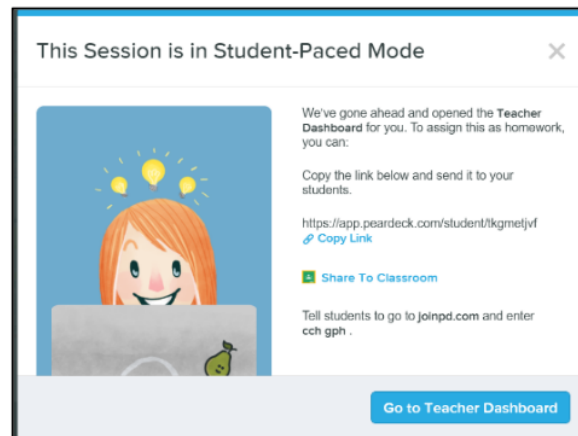


Figure 10. Feedback from teacher to students.



**Figure 11.** Student pace mode of Pear Deck.

The remaining extension criteria are related to connection to everyday lives and give the lowest percentage among other criteria. It is not because Pear Deck does not give access to everyday lives, but because of content coverage limitation in the developed material. The four meetings in linear algebra are still discussing the basics, not yet reaching the application. Finally, considering all criteria being discussed, Pear Deck can be one tool that can be adopted in the teaching and learning process during the pandemic to build engagement through interactivity, develop better understanding, and extend it to everyday lives. It is also in line with other research, which states that Pear Deck is the tool that can bring engagement in the class [18]. However, this research does not discuss how this engagement enhances understanding of the material and allows students to extend their knowledge by connecting it to their daily lives. Furthermore, many educational technology tools are found to be engaged the students only but not give better development of understanding [12]. The triple e framework used in this research has described the potential of Pear Deck as an educational tool that will not lead to false engagement.

## 5. Conclusion

The use of Pear Deck supports teachers in building engaging activities and allowing students to be active and time-on-task performers. Other than that, Pear Deck also allows students to enhance their comprehension by reflecting on the teacher's feedback. Without Pear Deck, it would be difficult for students to focus on the online mode task. Pear Deck allows students to open the teacher's supported websites without leaving the teacher's presentation. Pear Deck's use also needs to be supported by the flexibility problem to lead students to develop higher-order thinking skills [20]. This tool is beneficial, especially in online learning during the pandemic, as it brings positive vibes and encourages students to stay motivated during the class.

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