

Tackling Tangential Student Contributions

Blake E. Peterson

Keith R. Leatham

Shari L. Stockero

Laura R. Van Zoest



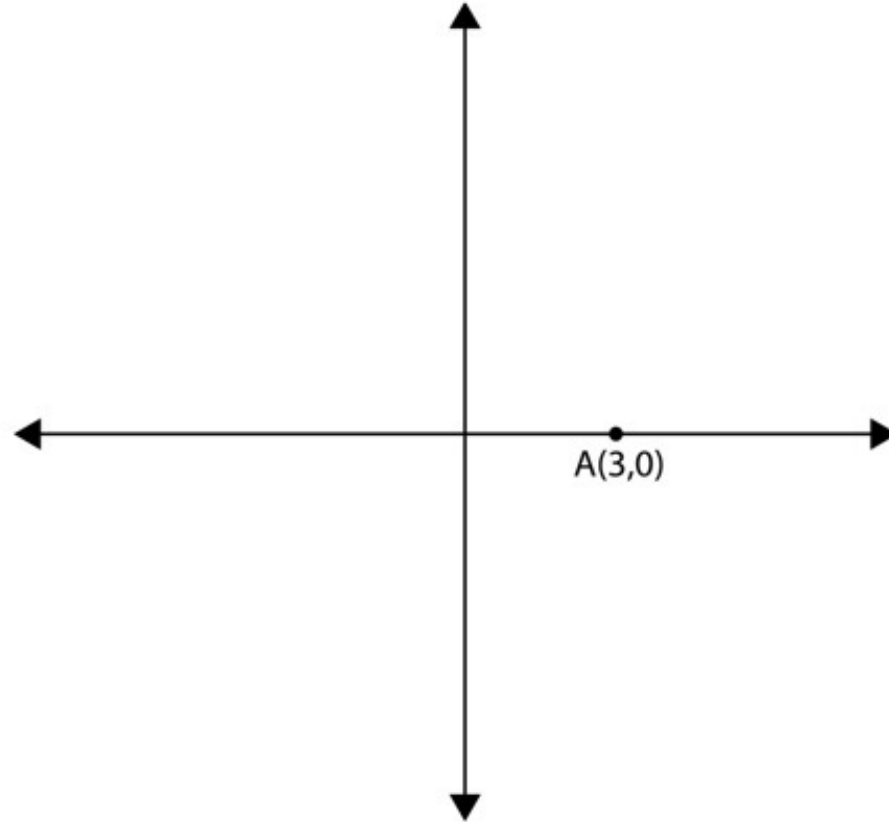
Michigan
Technological
University



This work was supported by the U.S. National Science Foundation (NSF) under Grant Nos. DRL-1720410, DRL-1720566, and DRL-1720613. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the NSF.

How might students solve this task?

Is it possible to select a point B on the y -axis so that the line $x + y = 6$ goes through both points A and B ? Explain why or why not.

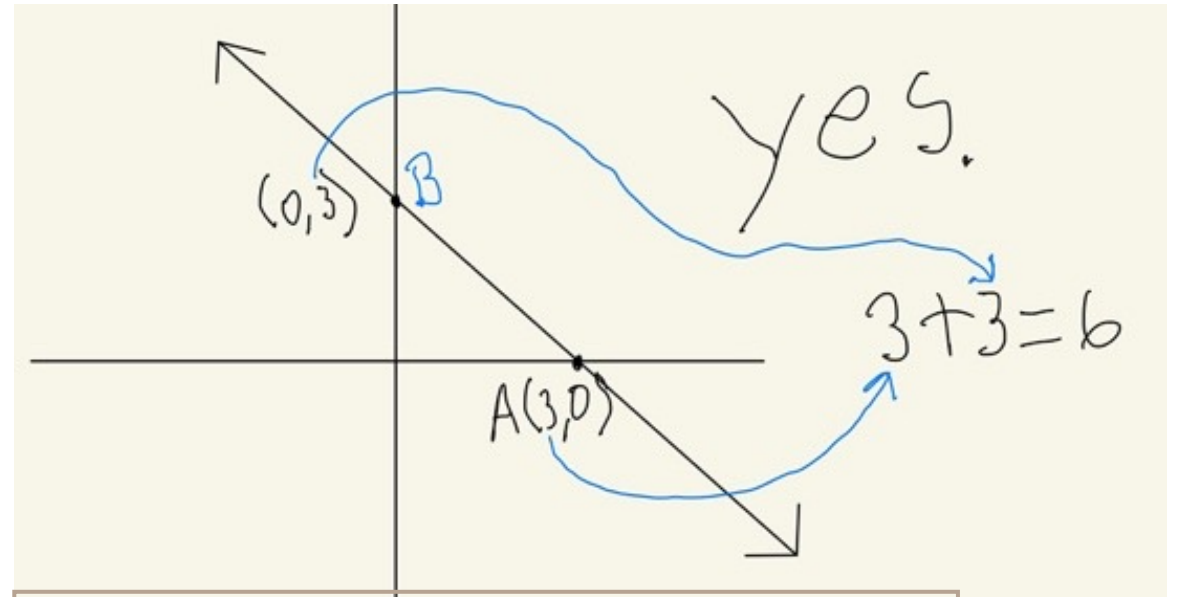


Ensuing Class Dialogue

Angel (Laura): Yes. Point B is $(0, 3)$ because you can put the 3 from point A in for x and the 3 from point B for the y and get $3 + 3 = 6$.

Teacher: [*Recording Angel's thinking*] What do others think about how this response holds up mathematically?

[*The class begins to engage in making sense of Angel's approach.*]



We call a student contribution that the teacher has chosen to pursue for some particular purpose a focal instance.



Ensuing Class Dialogue

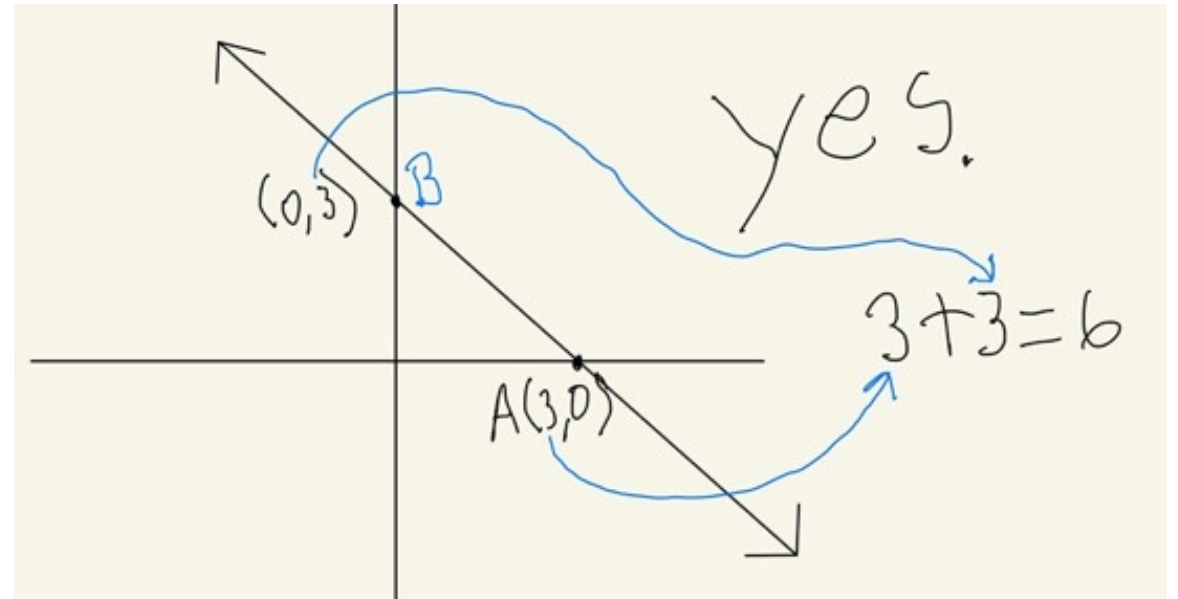
Angel (Laura): Yes. Point B is $(0, 3)$ because you can put the 3 from point A in for x and the 3 from point B for the y and get $3 + 3 = 6$.

Teacher: [Recording Angel's thinking] What do others think about how this response holds up mathematically?

[The class begins to engage in making sense of Angel's approach.]

Ben (Keith): If you write the equation in slope-intercept form, the y -intercept is $(0, 6)$.

Does Ben's contribution help the class make sense of Angel's contribution (the focal instance)?
Why or why not?



Tangential Student Contribution

Definition:

A contribution that wouldn't help the class move forward in their developing argument about the focal instance.

Common Example:

Student contribution focused on something else they had been thinking about that is only tangentially related to the focal instance.



Identifying Tangential Student Contributions

Task: The price of a necklace was first increased 50 percent and later decreased 50 percent. Is the final price the same as the original price? Why or why not?

Sonia (Shari): “When you increase by 50 percent of the original price, you get a new value, and then, if you times that by 50 percent, it’s going to be less than the original value.”

The teacher made Sonia’s contribution a focus of the class discussion (a focal instance) by asking “How does what Sonia said hold up mathematically?”



Identifying Tangential Student Contributions

Student Contribution: “When you increase by 50 percent of the original price, you get a new value, and then, if you times that by 50 percent, it’s going to be less than the original value.”

Subsequent student contributions (Is the contribution tangential?):

Laura: “On mine, I used the variable x to represent the original price.”

Shari: “I don’t think that’s right. If I increase by 50 percent of the original to get the new price and then just subtract that same amount from the new price, I would get back where I started. So the final price would be the same as the original.”

Definition of a Tangential Student Contribution: A contribution that wouldn’t help the class move forward in their developing argument about the focal instance.



Tips for Identifying Tangential Student Contributions

- Know the context
 - Work to stay aware of where the class is in the developing argument.
 - In your mind identify the mathematical point the developing argument is headed toward.
- Listen carefully to each contribution
- Identify the mathematical point of each contribution
- Ask yourself: Is there a reasonable path for the class to get from the mathematical point of the contribution to the mathematical point of the developing argument?



Tips for Identifying Tangential Student Contributions

- Know the context
 - Work to stay aware of where the class is in the developing argument.
 - In your mind identify the mathematical point the developing argument is headed toward.
- Listen carefully to each contribution
- Identify the mathematical point of each contribution
- Ask yourself: Is there a reasonable path for the class to get from the mathematical point of the contribution to the mathematical point of the developing argument? (Beware: Just because you see a path doesn't mean the students can see it.)



Tackling *Tangential* *Student* Contributions

Blake E. Peterson, Shari L. Stockero, Keith R. Leatham, and Laura R. Van Zoest

Peterson, B. E., Stockero, S. L., Leatham, K. R., & Van Zoest, L. R. (2022). Tackling tangential student contributions. *Mathematics Teacher: Learning and Teaching PK-12*, 115(9), 618-624.



Tangential Student Contributions

We will discuss ways to

- reduce the frequency of and
- respond to

instances of tangential student contributions



Tangential Student Contributions

We will discuss ways to

- **reduce the frequency of** and
- **respond to**

instances of tangential student contributions



Reducing the Frequency of Tangential Student Contributions

Ask targeted questions:

- Don't ask
 - What do you think?
 - Did others get a different solution?
- Do ask
 - How does Alfredo's idea help us make sense of Zoey's claim?

Establish Norms for Whole-Class Discussion

- Before having a student share their thinking, ask something like “Are you going to share something that will help us make sense of Daniella's claim?”



Reducing the Frequency of Tangential Student Contributions – General Principle

Avoid “Box of Chocolates” situations - You never know what you are going to get!

- Don't ask generic questions like “what do you think?”
 - (ask targeted questions)
- You don't have to call on every student who raises their hand.
 - (establish norms for students to be tracking the argument)



Tangential Student Contributions

We will discuss ways to

- reduce the frequency of and
- **respond to**

instances of tangential student contributions



Responding to Tangential Student Contributions

Gracefully “put aside” the tangential contribution.

Drageset (2014)

Recenter the discussion on the Focal Instance

EX: “You’ve just shared another way you could think about this task but remember that right now we’re making sense of Sonia’s claim.”

Our research suggests that putting aside without recentering leaves space for more tangential contributions.



Responding to Tangential Student Contributions (Let's Try It!)

Brandon (Keith): If I have point B at (0,3), um, then the answer would be yes, um, because if $x + y = 6$ then um, the 3 from the x here and the 3 from the y over here would make it true.

Teacher: [Recording Brandon's thinking shown at the right]

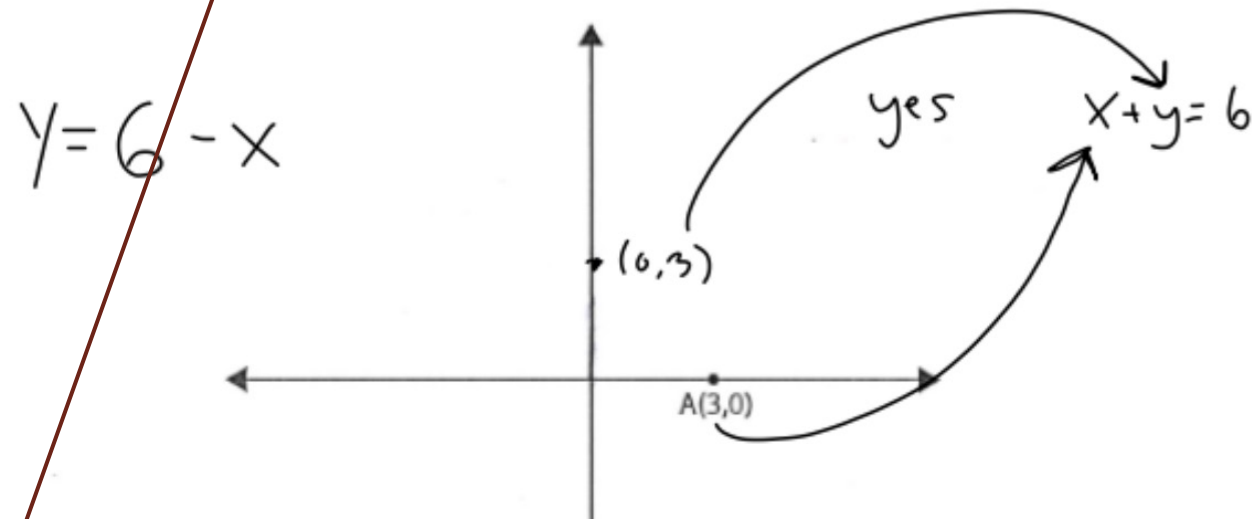
How does this claim hold up mathematically?

[The class has been discussing Brandon's approach.]

Maria (Laura): I think it's a lot easier for us to comprehend like stuff in slope-intercept form because that's what we've been learning about. So, if you just convert, like $x + y = 6$ into slope-intercept form then its $y = -x + 6$ and then the slope wouldn't go through those points.

Is Maria's contribution tangential? Why or Why not? If so, how do you put it aside and recenter?

Is it possible to select a point B on the y -axis so that the line $x + y = 6$ goes through both points A and B ? Explain why or why not.



Responding to Tangential Student Contributions (Let's Try It!)

Brandon (Keith): If I have point B at (0,3), um, then the answer would be yes, um, because if $x + y = 6$ then um, the 3 from the x here and the 3 from the y over here would make it true.

Teacher: [Recording Brandon's thinking shown at the right]

How does this claim hold up mathematically?

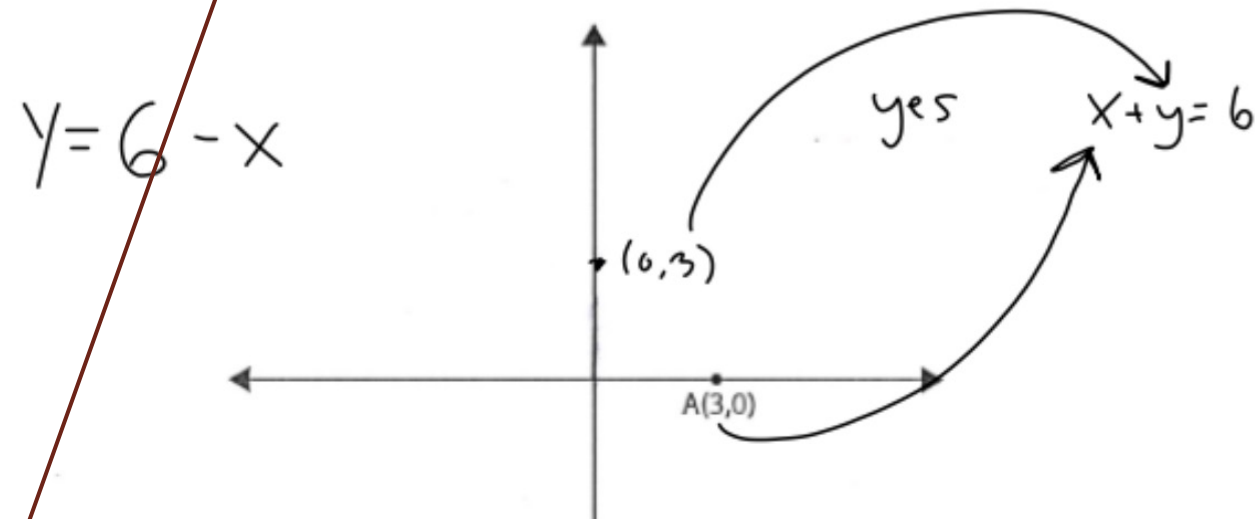
[The class has been discussing Brandon's approach.]

Maria (Laura): I think it's a lot easier for us to comprehend like stuff in slope-intercept form because that's what we've been learning about. So, if you just convert, like $x + y = 6$ into slope-intercept form then its $y = -x + 6$ and then the slope wouldn't go through those points.

This is what happened:

Teacher: It would be $y = -x + 6$. Then tell me more about this original claim.

Is it possible to select a point B on the y -axis so that the line $x + y = 6$ goes through both points A and B ? Explain why or why not.



Tangential Student Contributions

We have discussed ways to

- **reduce the frequency of and**
- **respond to**

instances of tangential student contributions



Reducing the Frequency of Tangential Contributions

Do	Don't



Reducing the Frequency of Tangential Contributions

Do	Don't
Ask targeted questions	



Reducing the Frequency of Tangential Contributions

Do	Don't
Ask targeted questions	
Work on developing norms around classroom discussion	



Reducing the Frequency of Tangential Contributions

Do	Don't
Ask targeted questions	Don't ask general questions, such as "What do you think?" or "What did others get?"
Work on developing norms around classroom discussion	



Reducing the Frequency of Tangential Contributions

Do	Don't
Ask targeted questions	Don't ask general questions, such as "What do you think?" or "What did others get?"
Work on developing norms around classroom discussion	Don't call on spontaneous volunteers using a general question, such as "Do you have something to share?"



Responding To Tangential Contributions

Do	Don't



Responding To Tangential Contributions

Do	Don't
Gracefully put aside the tangential student contribution	



Responding To Tangential Contributions

Do	Don't
Gracefully put aside the tangential student contribution and Recenter the focal instance	



Responding To Tangential Contributions

Do	Don't
Gracefully put aside the tangential student contribution and Recenter the focal instance	Don't just call on a new student or allow another student to spontaneously contribute (Box of Chocolates moves).





Thank you!

buildingonMOSTs.org

blake@byu.edu



Upcoming Building on MOST Presentations

Session: 434 - *Wait, What Are We Talking About? (Re)focusing Students During Whole-Class Discussion*

Time: 2:30 PM - 3:30 PM

Location: McCormick Place, S406 B

