

RUBRIC WITH PEDAGOGICAL MOVES FOR USING INTERACTIVE TECHNOLOGY TO TEACH MATHEMATICS

Wanda Villafaña-Cepeda, Omar Hernández-Rodríguez, *University of Puerto Rico*

Gloriana González, *University of Illinois*

This work is part of the project **Developing Technological Pedagogical Content Knowledge of Pre-service Math Teachers by Enhancement of a Methods Course Using Instrumental Orchestration and Lesson Study Strategies*** which main goal is to address the gap in the teacher education research about connections between methods courses and clinical experiences. We redesigned an early methods course to include clinical practices to help pre-service secondary mathematics teachers (PSTs) learn how to lead classroom discussions with interconnectivity technology. In the methods course, the PSTs learned to create math lessons using the Teacher Desmos Activity Builder (TDAB). In their field placements, they planned lessons using TDAB with their mentor teachers. The rubric supports PSTs' lesson planning with their mentor teachers by listing moves for using interactive technology and characteristics of the moves.

Interaction level	Move	Description	Set up	Pedagogical use	Example
Low	Multiple choice question	Create a question for students to select one or more answers.	https://www.youtube.com/watch?time_continue=10&v=oS0OcOi1Dnk&feature=emb_logo	Evaluate students' answers, provide feedback, determine more frequent responses, and promote discussion about students' responses.	In a lesson about systems of linear equations, students predict the solution, and the teacher starts a discussion about students' answers.
Medium	Open question	Create a question for students to write their answers.	https://www.youtube.com/watch?v=JQa8X0gu0OI&feature=emb_rel_pause	Check the students' answers, identify repeated answers, assess students' conceptual understanding and errors.	In a lesson about finding the slope of a line, students examine a collection of lines with the same y-intercept but different slopes. Students write characteristics of the lines.
Medium	Freeze/Teacher pacing	Select specific screens for students to work on.	https://learn.desmos.com/classroomconversation	Discuss differences and similarities in various screens.	In a linear regression lesson, students estimate the best fit line using "draw" with the same data set. The teacher uses "freeze" to discuss features of the lines drawn in relation to the slope and y-intercept.

The work is part of a project funded by the National Science Foundation, Division of Undergraduate Education (No. 1930950 & No. 1930971) granted to Omar Hernández-Rodríguez (PI), Wanda Villafaña-Cepeda (Co-PI) at the University of Puerto Rico, Río Piedras, and Gloriana González (PI) at the University of Illinois Urbana-Champaign. Any opinions, findings, conclusions, or recommendations presented are only those of the investigators; and do not necessarily reflect the views of the National Science Foundation.

Interaction level	Move	Description	Set up	Pedagogical use	Example
Medium	Pause	Stop the activity for students to see the screen without opportunities of interactions.	https://learn.desmos.com/classroomconversation	Use to focus students' attention on something the teacher indicates or pay attention to any discussion that is generated.	In a lesson about graph features of exponential functions, $f(x) = b^x$, the teacher uses "pause" to focus students' attention on graphs when $b > 1$ and $0 < b < 1$.
High	Snapshots	Take pictures of students' screens to share with the class.	https://www.youtube.com/watch?time_continue=11&v=yoN0PhPWgAQ&feature=emb_logo https://learn.desmos.com/snapshots	Share with the class students' answers. Discuss similar aspects and differences between students' screens.	In a lesson about transformations of quadratic functions, students perform a vertical translation of a graph. The teacher uses snapshots to show students' answers.
High	Overlay	Display students' answers by overlapping various graphs.	https://youtu.be/8c7Xpv99nvE?t=89	Display patterns, similarities, and differences from multiple graphs.	In a lesson about linear inequalities, students draw points corresponding to solutions of the inequality $y > 2x + 1$. Using overlay, the teacher shows that solutions fall on the same half-plane. Students recognize points that are not solutions since they are not on the same half-plane.

The work is part of a project funded by the National Science Foundation, Division of Undergraduate Education (No. 1930950 & No. 1930971) granted to Omar Hernández-Rodríguez (PI), Wanda Villafaña-Cepeda (Co-PI) at the University of Puerto Rico, Río Piedras, and Gloriana González (PI) at the University of Illinois Urbana-Champaign. Any opinions, findings, conclusions, or recommendations presented are only those of the investigators; and do not necessarily reflect the views of the National Science Foundation.