

Figures

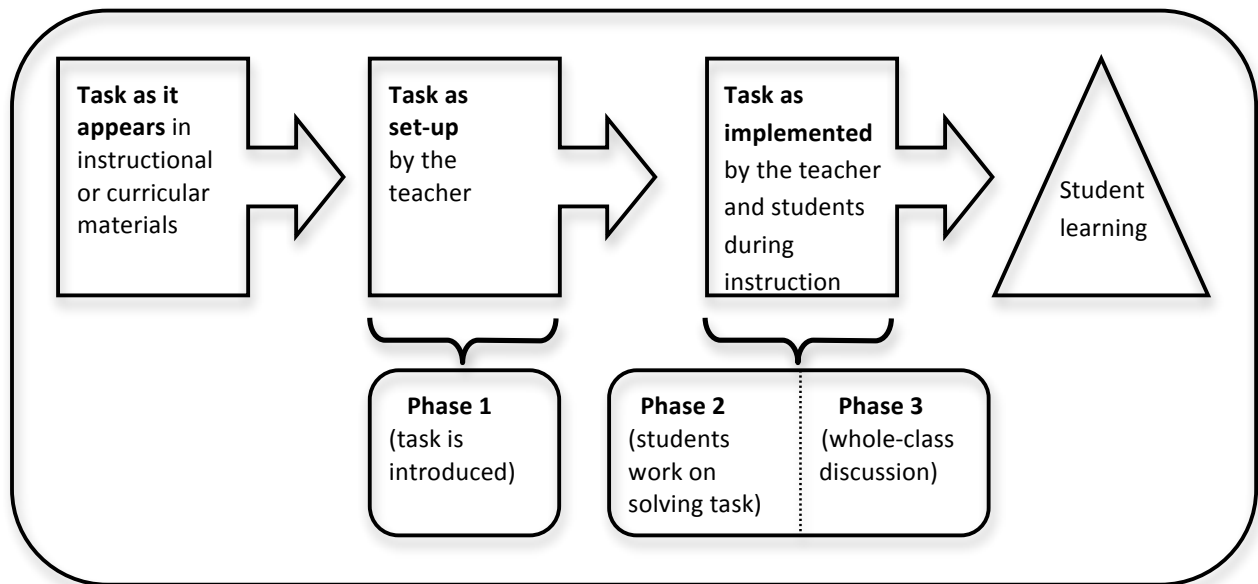


Figure 1. Mathematical Tasks Framework (Stein, et al., 2000) as it relates to a three-phase lesson structure.

### **Dollars for Dancing**

Three students at a school are raising dollars for the school's Valentine's Dance. All three decide to raise their money by having a dance marathon in the cafeteria the week before the real dance. They will collect pledges for the number of hours that they dance, and then they will give the money to the student council to get a good DJ for the Valentine's Dance.

Rosalba's plan is to ask teachers to pledge \$3 per hour that she dances.

Nathan's plan is to ask teachers to give \$5 plus \$1 for every hour he dances.

James's plan is to ask teachers to give \$8 plus \$0.50 for every hour he dances.

**Part A.** Create at least three different ways to show how to compare the amounts of money that the students can earn from their plans if they each get one teacher to pledge.

**Part B.** Explain how the hourly pledge amount is represented in each of your ways from Part A.

**Part C.** For each of your ways in Part A explain how the fixed amount in Nathan's plan and in James's plans is represented.

**Part D.** For each of the ways in Part A show how you could find the amount of money collected by each student if they could dance for 24 hours.

**Part E.** Who has the best plan? Justify your answer.

*Figure 2. "Dollars for Dancing." Adapted from Task 1.2 ("Raising Money"), Connected Mathematics Project 2 grade 7 book, Moving Straight Ahead: Linear Relationships (Lappan, Fey, Fitzgerald, Friel, & Phillips, 2009).*

	<b>Rubric</b>	<b>Focal Aspect of Instruction</b>
<b>TRADITIONAL IQA RUBRICS</b>	Task Potential	Cognitive demand of the task as it appears in the curricular materials
	Task Implementation*	Cognitive demand of the task as it is implemented (after students start to work on solving the task through the end of the lesson)
	Academic Rigor of the Discussion	Academic rigor of the whole-class discussion
	Participation*	The percentage of students who participate in the whole-class discussion
	Teacher Linking*	Teacher links between contributions within the whole-class discussion
	Student Linking	Student links between contributions within the whole-class discussion
	Teacher Asking*	Teacher press for conceptual explanations within the whole-class discussion
<b>SET-UP RUBRICS</b>	Student Providing	Student providing of conceptual explanations within the whole-class discussion
	Contextual Features	Building a taken-as-shared understanding of the contextual features of the problem solving scenario in the task statement
	Mathematical Relationships	Building a taken-as-shared understanding of the mathematical relationships and ideas in the task statement
	Set-Up Maintenance	Maintenance of the cognitive demand of the task specific to the set-up phase of instruction
	Post Set-Up Task Potential*	Cognitive demand of the task (based on the instructional materials) at the end of the set-up
Set-Up Participation*	The percentage of students who participate in the set-up discussion	

Figure 3. Expanded IQA rubrics and focal aspects of instruction. Note: Rubrics marked with \* are not included in this analysis.

Tables

Table 1

*Reliability Scores for the Expanded IQA Rubrics*

Rubric	Percent Agreement	Kappa
Task Potential	78.9	.69
Academic Rigor of the Discussion	71.4	.59
Student Linking	88.9	.60
Student Providing	88.9	.80
Set-Up Maintenance	82.1	.60
Contextual Features	75	.59
Mathematical Relationships	82.1	.64

Table 2

*Descriptive Statistics of Traditional IQA Scores across 242 Lessons*

Rubric	Mean (SD)	Minimum	Maximum
Task Potential	2.75 (0.77)	1	4
Discussion	1.48 (1.09)	0	4
Student Linking	0.93 (0.65)	0	3
Student Providing	1.30 (1.00)	0	4

Table 3

*Frequencies of Particular Scores for Contextual Features and Mathematical Relationships by Use of Task with or without PSS*

	PSS task (N = 138)		Non-PSS task (N = 104)	
	CF	MR	CF	MR
4	2 (2%)	6 (4%)	5 (5%)	5 (5%)
3	10 (7%)	17 (12%)	10 (10%)	10 (10%)
2	19 (14%)	88 (63%)	66 (63%)	66 (63%)
1	39 (28%)	19 (13%)	16 (15%)	16 (15%)
0	68 (49%)	8 (6%)	7 (7%)	7 (7%)
Mean	.83	1.96	1.90	1.90
SD	1.02	.82	.84	.84

*Note.* The percentage listed is the percentage of the total number of lessons in the type-of-task category (i.e., out of 138 lessons with PSS tasks and out of 104 lessons with non-PSS tasks).

Table 4

*Cross-tabulation of Contextual Features and Mathematical Relationships for Lessons with PSS Tasks*

Mathematical Relationships	Contextual Features				
	4	3	2	1	0
4	1	1	3	1	0
3	1	6	5	3	2
2	0	3	9	25	51
1	0	0	1	8	10
0	0	0	1	2	5

Table 5

*Task Potential with Set-Up Maintenance*

Task Potential	Set-Up Maintenance			% Decrease
	Maintain	Decrease	Total	
4	27	17	44	38.6%
3	33	64	97	66.0%
2	28	69	97	71.1%
1	2	2	4	50.0%

Table 6

*Mathematical Relationships and Contextual Features Score Pairs with the Percentage of Set-Ups in which the Cognitive Demand was Decreased*

CF	Mathematical Relationships					CF Score % Dec
	4	3	2	1	0	
4	1	1	0	0	0	50%
3	1	6	3	0	0	49.8%
2	3	5	9	1	1	58%
1	1	3	25	8	2	59.1%
0	0	2	51	14	5	67.7%
No PSS	5	10	66	16	7	62.7%
MR Score % Dec	18.2%	55.5%	76.6%	48.8%	0%	

Table 7

*Relationships between Aspects of the Set-Up and Academic Rigor of the Discussion*

Academic Rigor of the Discussion	(1) Baseline MR (PSS) N= 138	(2) Baseline MR (non-PSS) N =104	(3) MR Levels (PSS) N = 138	(4) MR Levels (non-PSS) N=104	(5) MR Levels (All) N = 242	(6) Baseline MR & CF (PSS) N=138	(7) MR Levels with CF (PSS) N = 138	(8) CF Levels with MR (PSS) N = 138
Task Potential Maint.	.018 (.132)	.281** (.128)	-.006 (.132)	.303** (.130)	.141 (.092)	.009 (.132)	-.010 (.132)	.015 (.136)
MR	.751*** (.196)	.419** (.182)	.537** (.218)	.270 (.201)	.484** (.150)	.704*** (.198)	.534** (.218)	.704*** (.199)
MR- 1	.373** (.111)	.345** (.111)				.297** (.123)		.300** (.125)
MR- 2			-.747* (.444)	.123 (.435)	-.191 (.316)		-.746* (.445)	
MR- 3			-.199 (.414)	.271 (.397)	.168 (.293)		.207 (.489)	
MR- 4			.495 (.463)	1.06** (.468)	.842** (.335)		.358 (.489)	
CF			.878 (.571)	1.18** (.546)	1.10** (.400)	.142 (.099)	.091 (.105)	
CF- 1								.184 (.213)
CF- 2								.200 (.291)
CF- 3 or 4								.553 (.366)
Non-PSS					-.115 (.138)			
District B	-.485* (.278)	-.072 (.284)	-.494 (.304)	-.033 (.296)	-.356* (.197)	-.474* (.283)	-.489 (.306)	-.454 (.282)
District C	-.534* (.290)	-.058 (.314)	-.640** (.318)	-.039 (.327)	-.421** (.209)	-.492* (.296)	-.607* (.322)	-.490* (.292)
District D	-.347 (.293)	.183 (.282)	-.360 (.318)	.136 (.293)	-.157 (.203)	-.352 (.298)	-.357 (.321)	-.367 (.294)
Constant	1.65** (.537)	.270 (.470)	2.47*** (.614)	.428 (.537)	1.47** (.428)	2.47** (.614)	2.42*** (.618)	1.61** (.574)

\* p&lt;.1. \*\*p&lt;.05. \*\*\*p&lt;.001.

Table 8

*Relationships between Aspects of the Set-Up and Student Linking*

Student Linking	(1) Baseline MR (PSS) N= 138	(2) Baseline MR (non-PSS) N =104	(3) MR Levels (PSS) N= 138	(4) MR Levels (non-PSS) N=104	(5) MR Levels (All) N =242	(6) Baseline MR & CF (PSS) N=138	(7) MR Levels with CF (PSS) N = 138	(8) CF Levels with MR (PSS) N = 138
Task Potential Maint.	.026 (.081)	.136 (.089)	.009 (.081)	.155* (.090)	.064 (.058)	.022 (.080)	.007 (.080)	-.017 (.082)
MR	.307** (.119)	.223* (.128)	.162 (.132)	.217 (.142)	.175 (.096)	.270** (.119)	.161* (.132)	.275** (.120)
MR- 1	.188** (.067)	.146* (.078)				.130* (.074)		.131* (.075)
MR- 2			-.432 (.269)	.047 (.304)	-.2.17 (.200)		-.428 (.268)	
MR- 3			-.184 (.250)	.270 (.279)	.018 (.186)		-.186 (.250)	
MR- 4			.087 (.280)	.643* (.331)	.333 (.211)		-.044 (.295)	
CF			.618* (.346)	.256 (.386)	.329 (.254)	.109* (.060)	.090 (.064)	
CF- 1								.092 (.128)
CF- 2								.131 (.175)
CF- 3 or 4								.426* (.221)
Non-PSS					-.006 (.087)			
District B	-.088 (.174)	-.213 (.196)	-.074 (.189)	-.171 (.196)	-.178 (.143)	-.081 (.176)	-.073 (.188)	-.068 (.174)
District C	-.122 (.181)	-.177 (.217)	-.169 (.197)	-.146 (.217)	-.199 (.152)	-.092 (.183)	-.138 (.197)	-.098 (.180)
District D	-.047 (.182)	.043 (.195)	-.028 (.197)	.073 (.195)	-.020 (.146)	-.053 (.184)	-.028 (.196)	-.068 (.181)
Constant	.771** (.327)	.535 (.328)	1.244** (.373)	.477 (.372)	.943** (.273)	.774** (.325)	1.189** (.373)	.801** (.347)

\* p&lt;.1. \*\*p&lt;.05. \*\*\*p&lt;.001.

Table 9

*Relationships between Aspects of the Set-Up and Student Providing*

Student Providing	(1) Baseline MR (PSS) N= 138	(2) Baseline MR (non-PSS) N =104	(3) MR Levels (PSS) N= 138	(4) MR Levels (non-PSS) N=104	(5) MR Levels (All) N = 242	(6) Baseline MR & CF (PSS) N=138	(7) MR Levels with CF (PSS) N = 138	(8) CF Levels with MR (PSS) N = 138
Task Potential Maint.	.000 (.121)	.175 (.124)	-.024 (.122)	.170 (.126)	.072 (.086)	-.008 (.121)	-.031 (.122)	-.040 (.123)
MR	.658*** (.180)	.355** (.173)	.484** (.201)	.267 (.190)	.450** (.140)	.623** (.181)	.478** (.201)	.634*** (.180)
MR- 1	.381*** (.103)	.255** (.106)				.313** (.113)		.301** (.114)
MR- 2			-.621 (.415)	.263 (.422)	-.082 (.296)		-.635 (.413)	
MR- 3			-.043 (.385)	.267 (.380)	.265 (.274)		-.066 (.384)	
MR- 4			.474 (.431)	.698 (.449)	.726** (.313)		.293 (.453)	
CF			1.130** (.530)	1.175** (.523)	1.257** (.376)		.940* (.554)	
CF- 1						.128 (.091)	.111 (.098)	
CF- 2								-.047 (.194)
CF- 3 or 4								-.007 (.266)
Non-PSS					-.090 (.128)			.684** (.333)
District B	-.383* (.232)	-.074 (.285)	-.359 (.258)	-.077 (.293)	-.281 (.174)	-.376 (.234)	-.342 (.267)	-.343 (.234)
District C	-.506** (.244)	-.229 (.316)	-.577 (.272)	-.231 (.324)	-.440** (.185)	-.471* (.246)	-.532* (.282)	-.515** (.245)
District D	-.256 (.248)	-.095 (.283)	.232 (.273)	-.150 (.291)	-.183 (.180)	-.262 (.249)	-.218 (.281)	-.311 (.247)
Constant	1.334** (.487)	.656 (.459)	2.063*** (.565)	.787 (.521)	1.369** (.397)	1.354** (.486)	2.016*** (.568)	1.552** (.515)

\* p&lt;.1. \*\*p&lt;.05. \*\*\*p&lt;.001.