Elective 6: Diagnosing Student Misconceptions in Force and Motion

Melissa Roberts

Overview:

For this elective assignment, I designed a diagnostic test using questions from Diagnoser.com. I divided the diagnostic into five categories dealing with motion: Position and Distance; Change in Direction; Determining Speed; Change in Speed; and Average Speed. Each category had three to six multiple choice or short-answer questions to assess student understanding. I administered the diagnostic using GoFormative to one of my 8th grade physical science classes. A total of 17 students took the diagnostic. We do not study physics until the spring, so my students had no exposure to the content before the diagnostic. The diagnostic questions are attached as a Word document. On the following tabs you will find my students' raw data, a graphical representation by question/category, and classroom applications based on the results.

NOTE: If you have a GoFormative account, you can create a copy of the diagnostic using the link below:

https://goformative.com/clone/46XWY2

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Timestamp	Username	%	Total Score	Q1. (conte	Q2. (conte	Q3. (conte	Q4. (conte	Q5. (conte
Key			25	E	C	B	A	D
11/9/2020	launkst32	30.77	8	D	E	B	B	A
11/9/2020	jaustins74	53.85	14	D	C	A	A	D
11/9/2020	lbellido35	30.77	8	D	E	A	D	C
11/9/2020	wbrouse37	26.92	7	C	C	A	A	C
11/9/2020	afriend86	42.31	11	E	C	A	D	D
11/9/2020	again er19	34.62	10	E	C	A	B	A
11/9/2020	rjarrett66	30.77	8	E	E	A	B	A
11/9/2020	jlangdon73	69.23	18	E	C	B	A	D
11/9/2020	mmccaffe22	38.46	10	E	B	C	C	B
11/9/2020	amoser88	34.62	9	E	C	C	B	A
11/9/2020	lrider22	46.15	12	E	C	A	B	A
11/9/2020	croush55	38.46	10	E	C	A	B	A
11/9/2020	asassama23	26.92	7	E	E	A	B	D
11/9/2020	cswartze35	38.46	10	E	C	B	B	A
11/9/2020	yvargas68	30.77	8	E	E	A	B	A
11/9/2020	mwatkins83	26.92	7	E	E	A	B	A
11/9/2020	mzeiber98	26.92	7	E	C	A	B	A
			Correct:	13	10	3	3	4
		Avg. Score:	9.65					

Q6. (conte	Q7. (conte	Q8. (conte	Q9. (conte	Q10. (content blc	Q11. (cont	Q12. (cont	Q13. (cont	Q14. (cont
B	18, 18 cm	C	D	10, 10 cm	D	B	C	B
C	18cm	D	A	10cm	E	A	A	A
B	18 cm	C	D	18 cm	C	B	C	A
D	48 cm	E	D	10 cm	E	B	A	A
E		C	C		C	B	A	A
C	30 cm	C	D	6 cm	D	B	A	B
C	10 cm	E	D	the ants change i	C	B	A	A
C	48 cm	E	A	10 cm	A	C	A	A
B	20cm	C	D	10cm	D	B	C	A
C	16 cm	C	A	16 cm	E	B	B	A
C	48cm	E	D	4cm	E	A	A	A
C	20cm	E	D	20cm	D	B	A	A
B	20 cm	D	D	10 cm	E	B	A	A
C	50cm	E	A	-4cm	E	C	A	A
C	10 cm	D	A	10 cm	D	B	B	C
C	18cm	E	A	18cm	B	B	A	A
C	50 cm	E	D	14 cm	B	A	D	A
C	12cm	B	A	14cm	E	A	A	A
	3	3	5	9	7	4	11	2	1

Q15. (cont	Q16. (cont	Q17. (cont	Q18. (cont	Q19. (cont	Q20. (cont	Q21. (cont	Q22. (cont	Q23. (cont	Q24. (cont
2, 2 cm/se	A	A	C	B	D	2.5, 2.5 m/	C	3, 3 m/s,	D
4cm/sec	A	A	C	B	D	3.8meters/	A	25 meter/	E
3 cm/sec	D	B	C	B	A	2.5 meters	C	3 meters/s	C
4 cm/sec	A	A	C	B	D	3.1 meters	A	5 meters/s	A
	A	A	B	C	C		B		E
4	C	A	C	B	C	3.1 meters	D	5 meters/s	C
4cm/2 sec	A	A	C	B	D	18.25 met	E	15 meters	B
4 cm/sec	A	A	C	B	E	5 m/s	C	16 m/s	D
2cm/sec	A	A	C	B	D	1.5mps	D	3mps	C
2 cm/sec	A	A	C	B	D	4.16 mete	B	5 meters/s	E
4 cm/sec	B	A	C	B	D	2-May	C	7.5 meters	D
2cm/sec	A	A	C	B	D	around 19.	E	2.5meters/	E
4 cm	A	A	A	B	A	4.1 meters	E	18.4 mete	E
4 cm/sec	A	A	C	B	A	5 meters/s	C	5 meters/s	A
3 cm/sec	A	A	C	B	A	2.14 m/se	E	8.3 m/sec	C
4cm	A	A	C	B	D	17.5 mete	E	17.5 mete	E
4 cm/sec	A	A	C	B	D	19 meters/	E	16 meters/	E
4cm/secs	A	A	C	B	B	19.4meter	B	15.4meter	D
	3	14	16	15	16	9	2	4	2	3

Q25. (content block)

B
C
B
C
B
A
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D
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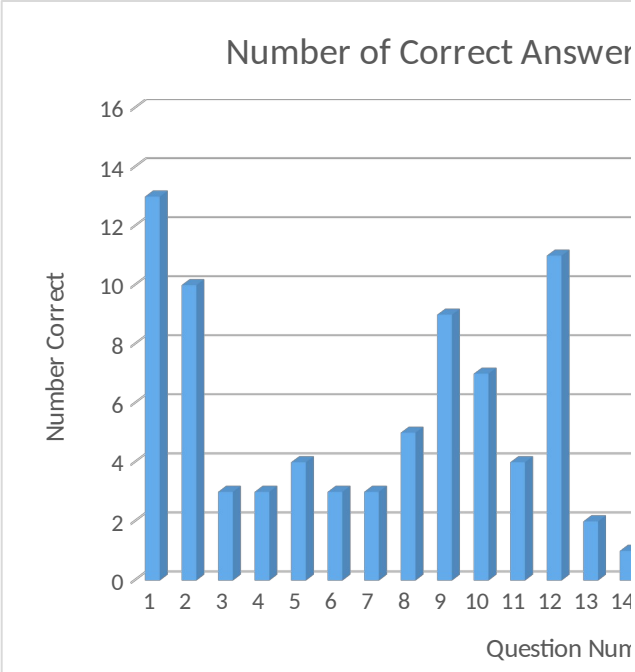
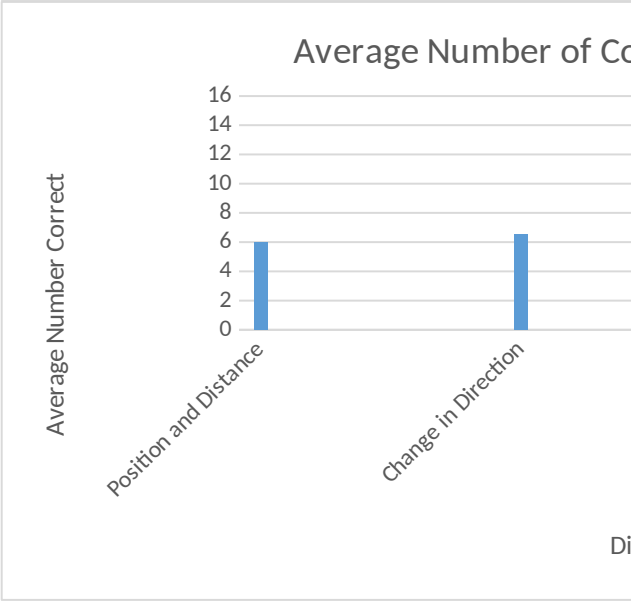
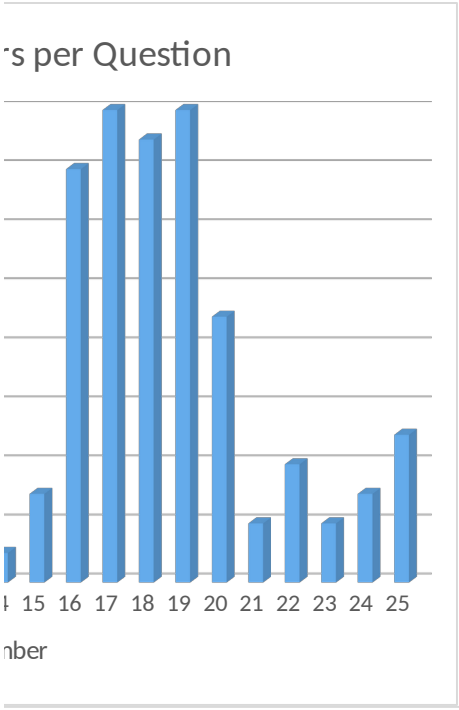
	Question Number	Number Correct	Average Correct Per Category
Position and Distance	1	13	
	2	10	
	3	3	
	4	3	
	5	4	
	6	3	6
Change in Direction	7	3	
	8	5	
	9	9	
	10	7	
	11	4	
	12	11	6.5
Determining Speed	13	2	
	14	1	
	15	3	
	16	14	
	17	16	7.2
Change in Speed	18	15	
	19	16	
	20	9	13.3
Average Speed	21	2	
	22	4	
	23	2	
	24	3	
	25	5	3.2






s per Question
15 16 17 18 19 20 21 22 23 24 25
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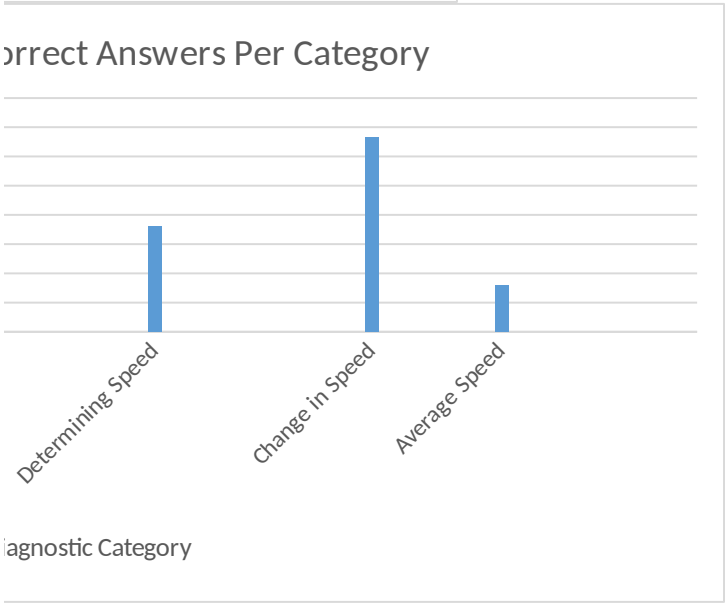
rrect Answers Per Category
Determining Speed
Change in Speed
Average Speed
agnostic Category

Strengths & Weknesses:

Based on the diagnostic results, my students do not have a solid understanding of n
They performed best on the Change in Speed category of the diagnostic with an ave
13.3 students getting each question in the section correct, followed by the Determ
Speed category with an average of 7.2 students getting each question in the section
The students scored best on questions 16, 17, 18, and 19. Only an average of 3.2 st
answered each question correctly in the Average Speed category. This category is a
weakness for my students.

Classroom Application & Remediation:

The diagnostic results make it clear that there is a limited understanding of motio
introduce my students to the Positions and Distance and Change in Direction concep
use "The Moving Man" Phet simulation. This simulation allows students to discove
motion is graphed on a time vs. position graph. I can also use the "Match That Gr
concept builder from The Physics Classroom for additional practice in determinin
graphical representation of an object's motion. The Average Speed category was
greatest weakness. To help my students understand the concept of speed, I comple
in which we calculate their average speed of running, hopping, skipping, etc. down t
To reinforce this topic, I could also use the "Dungeon Simulation" from ck-12, which
the students to solve the speed that an object must travel to reach a particular dest
or the "Distance, Average Speed, and Time Virtual Lab" from Glencoe in which stu
investigate the distance an object moves based on its speed. To conclude, althoug
students scored well in speed (Determining Speed and Change in Speed), they do no
clear understanding of motion overall. I would be interested to see the results of
diagnostic after instruction on these topics, and then I would better be able to pin
misconceptions and remediate accordingly.

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Resources Metioned:

The Moving Man:	https://phet.colorado.edu/en/simulation/moving-man
Match That Graph:	https://www.physicsclassroom.com/Concept-Builders/Kinematics
Dungeon Simulation:	https://www.ck12.org/physics/Average-Velocity/simulation/Dung
Distance, Average Speed, and Time Virtual Lab:	http://www.glencoe.com/sites/common_assets/science/virtual_l