Blending Lifelong Learning Skills with Content – Worksheets and Examples

Backward Course Design

Start with Learning Goals and Outcomes in order to inform learning experiences and assessments

- **Lifelong Learning Skills and Content Learning Goals:** What you want students to learn and/or keep learning. May combine your own goals with program/campus goals. These could be on-going and don't have to be assessable themselves. What lifelong learning skill(s) and content are at the core of your discipline/topic?
  Example: Be effective problem-solvers and develop different approaches to, and representations of, the material.
    - **Current Goal:**
    - **Modified or New Goal:**
    - **After-Peer-Review Goal:**
- **Lifelong Learning Skills and Content Learning Outcomes:** What will students be able to demonstrate that they have learned by the end of the course that is related to the learning goals? This must be measureable/assessable in at least one way.
  "Formula" for Outcomes: Observable behavior/verb phrase (Bloom's Taxonomy) + "in order to" + reason why. (From: ACRL Immersion Assessment Program)
  Example: Analyze and solve physics problems using an expert approach in order to identify main concepts, logically progress through problems, and increase confidence and use of symbolic manipulation [Bloom's Level: Analyzing]
    - **Current Outcome:**
    - **Modified or New Outcome:**
    - **After-Peer-Review Outcome:**

- **Lifelong Learning Skills and Content Learning Experiences:** Activities, in-class work, outside class work, projects, etc. What will you and the students do in order for students to achieve the goals and related outcomes?
  Examples: 1) Solve problems in groups on whiteboards in class and share student work on the projector screen. 2) Online homework. 3) The quantitative exam problems are student-created according to certain requirements and the problem-solving guideline.
  - **Current Learning Experience:**
  - **Modified or New Learning Experience:**
  - **After-Peer-Review Learning Experience:**
- **Lifelong Learning Skills and Content Assessment:** Proof that the students (and you) are achieving outcomes.
  Examples: 1) While whiteboard work is projected, and explained by a student, the work is questioned and annotated. 2) Three online homework problems are expected to be worked out on paper according to a problem-solving guideline and turned in for one to be randomly graded and given feedback. 3) The quantitative questions for the exams that fulfill the requirements, and are solvable, are posted for review by students prior to the exam. The chosen questions are then outlined according to the problem-solving guideline on the exam.
  - **Current Assessment:**
  - **Modified or New Assessment:**
  - **After-Peer-Review Assessment:**

Backward Course Design Peer Review Worksheet

1. **Learning Goal**: In your own words, what does the instructor want you to learn that is related to lifelong learning skill(s)? How well is this articulated?

2. **Learning Outcome**: In your own words, what is the observable behavior/verb phrase?

   Why should you want to achieve this outcome? What should it help you to be able to do in terms of lifelong learning skill(s) and/or content?

3. **Learning Experience**: How well does the stated learning experience follow the learning outcome?

   List and explain at least one other learning experience that you believe would accomplish the stated learning outcome.

4. **Assessment**: How well does the stated assessment measure the learning outcome?

   List and explain at least one other assessment that you believe would accomplish the stated learning outcome that you could incorporate into, or after, the learning experience.

Group Work Evaluation Form

Modified from: Classroom Assessment Techniques: A Handbook for College Teachers 2nd Ed. by Thomas A. Angelo and K. Patricia Cross, 1993, p. 350

1. Overall, how effectively did your group work together today?

   Poorly Adequately Well Extremely Well

2. How many group members participated actively most of the time?

   ________ out of ________

3. How many fulfilled their roles?

   ________ out of ________

4. Give one specific example of something you learned from the group that you probably wouldn't have learned working alone.

5. Give one specific example of something the other group members learned from you that they probably wouldn't have learned otherwise.

6. Suggest one change the group could make to improve its performance.

References

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Teaching Goals Inventory, Self-Scorable Version Instructions

Purpose: The Teaching Goals Inventory (TGI) is a self-assessment of instructional goals. Its purpose is threefold: (1) to help college teachers become more aware of what they want to accomplish in individual courses; (2) to help faculty locate Classroom Assessment Techniques they can adapt and use to assess how well they are achieving their teaching and learning goals; and (3) to provide a starting point for discussions of teaching and learning goals among colleagues.

Directions: Please select ONE course you are currently teaching. Respond to each item on the inventory in relation to that particular course. (Your responses might be quite different if you were asked about your overall teaching and learning goals, for example, or the appropriate instructional goals for your discipline.)

Please rate the importance of each of the fifty-two goals listed on the TGI to the specific course you have selected. Assess each goal's importance to what *you* deliberately aim to have your students accomplish, rather than the goal's general worthiness or overall importance to your institution's mission. There are no "right" or "wrong" answers; only personally more or less accurate ones.

For each goal, circle only one response on the 1-to-5 rating scale. You may want to read quickly through all fifty-two goals before rating their relative importance. In relation to the course you are focusing on, indicate whether each goal you rate is:

(5) Essential	a goal you always/nearly always try to achieve
(4) Very important	a goal you often try to achieve
(3) Important	a goal you sometimes try to achieve
(2) Unimportant	a goal you rarely try to achieve
(1) Not applicable	a goal you never try to achieve

Teaching Goals Inventory for: ______________________________

(print name of focus course)

5-Essential 4-Very Important 3-Important 2-Unimportant 1-Not applicable

1. Develop ability to apply principles and generalizations already learned to new problems and situations.	5 4 3 2 1
2. Develop analytic skills.	5 4 3 2 1
3. Develop problem-solving skills.	5 4 3 2 1
4. Develop ability to draw reasonable inferences from observations.	5 4 3 2 1
5. Develop ability to synthesize and integrate information and ideas.	5 4 3 2 1
6. Develop ability to think holistically: to the whole as well as the parts.	5 4 3 2 1
7. Develop ability to think creatively.	5 4 3 2 1
8. Develop ability to distinguish between fact and opinion.	5 4 3 2 1
------------------------------Tally for each rating column in this section:	| | | |
9. Improve skill at paying attention.	5 4 3 2 1
10. Develop ability to concentrate.	5 4 3 2 1
11. Improve memory skills.	5 4 3 2 1
12. Improve listening skills.	5 4 3 2 1
13. Improve speaking skills.	5 4 3 2 1
14. Improve reading skills.	5 4 3 2 1
15. Improve writing skills.	5 4 3 2 1
16. Develop appropriate study skills, strategies, and habits.	5 4 3 2 1
17. Improve mathematical skills.	5 4 3 2 1
------------------------------Tally for each rating column in this section:	| | | |
18. Learn terms and facts of this subject.	5 4 3 2 1
19. Learn concepts and theories in this subject.	5 4 3 2 1
20. Develop skill in using materials, tools, and/or technology central to this subject.	5 4 3 2 1
21. Learn to understand perspectives and values of this subject.	5 4 3 2 1
22. Prepare for transfer or graduate study.	5 4 3 2 1
23. Learn techniques and methods used to gain new knowledge in this subject.	5 4 3 2 1
24. Learn to evaluate methods and materials in this subject.	5 4 3 2 1
25. Learn to appreciate important contributions to this subject.	5 4 3 2 1
------------------------------Tally for each rating column in this section:	| | | |
26. Develop an appreciation of the liberal arts and sciences.	5 4 3 2 1
27. Develop an openness to new ideas.	5 4 3 2 1
28. Develop an informed concern about contemporary social issues.	5 4 3 2 1
29. Develop a commitment to exercise the rights and responsibilities of citizenship.	5 4 3 2 1
30. Develop a lifelong love of learning.	5 4 3 2 1
31. Develop aesthetic appreciations.	5 4 3 2 1
32. Develop an informed historical perspective.	5 4 3 2 1
33. Develop an informed understanding of the role of science and technology.	5 4 3 2 1

34. Develop an informed appreciation of other cultures.	5 4 3 2 1
35. Develop capacity to make informed ethical choices.	5 4 3 2 1
-------------------------------Tally for each rating column in this section:	| | | |
36. Develop ability to work productively with others.	5 4 3 2 1
37. Develop management skills.	5 4 3 2 1
38. Develop leadership skills.	5 4 3 2 1
39. Develop a commitment to accurate work.	5 4 3 2 1
40. Improve ability to follow directions, instructions, and plans.	5 4 3 2 1
41. Improve ability to organize and use time effectively.	5 4 3 2 1
42. Develop a commitment to personal achievement.	5 4 3 2 1
43. Develop ability to perform skillfully.	5 4 3 2 1
-------------------------------Tally for each rating column in this section:	| | | |
44. Cultivate a sense of responsibility for one's own behavior.	5 4 3 2 1
45. Improve self-esteem/self-confidence.	5 4 3 2 1
46. Develop a commitment to one's own behavior.	5 4 3 2 1
47. Develop respect for others.	5 4 3 2 1
48. Cultivate emotional health and well-being.	5 4 3 2 1
49. Cultivate an active commitment to honesty.	5 4 3 2 1
50. Develop capacity to think for one's self.	5 4 3 2 1
51. Develop capacity to make wise decisions.	5 4 3 2 1
52. In general, how do you see your primary role as a teacher? (Although more than one statement may apply, please circle only one.) 1. Teaching students facts and principles of the subject matter. 2. Providing a role model for students. 3. Helping students develop higher-order thinking skills. 4. Preparing students for jobs/careers. 5. Fostering student development and personal growth. 6. Helping students develop basic learning skills.	Record score here and include in section tally: ___________
-------------------------------Tally for each rating column in this section:	| | | |

Teaching Goals Inventory Scoring Sheet

1. In all, how many of the fifty-two goals did you rate as "essential" (rating=5)?___________

2. How many "essential" goals did you have in each of the six clusters listed below?

Cluster Number and Name	Goals Included in Cluster	Total Number of "Essential" Goals in Each Cluster (rating=5)	Clusters Ranked – from 1st to 6th – by Number of "Essential" Goals
I Higher-Order Thinking Skills	1-8		
II Basic Academic Success Skills	9-17		
III Discipline-Specific Knowledge and Skills	18-25		
IV Liberal Arts and Academic Values	26-35		
V Work and Career Preparation	36-43		
VI Personal Development	44-52		

3. Compute your cluster scores (average item ratings by cluster) using the following worksheet.

Cluster Number and Name	Goals Included	Sum of Ratings Given to Goals in That Cluster	Divide C by This Number	Your Average Cluster Score
I Higher-Order Thinking Skills	1-8		8	
II Basic Academic Success Skills	9-17		9	
III Discipline-Specific Knowledge and Skills	18-25		8	
IV Liberal Arts and Academic Values	26-35		10	
V Work and Career Preparation	36-43		8	
VI Personal Development	44-52		9	

REVISED Bloom's Taxonomy Action Verbs

Definitions	I. Remembering	II. Understanding	III. Applying	IV. Analyzing	V. Evaluating	VI. Creating
Bloom's Definition	Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers.	Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas.	Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.	Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations.	Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria.	Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions.
Verbs	• Choose • Define • Find • How • Label • List • Match • Name • Omit • Recall • Relate • Select • Show • Spell • Tell • What • When • Where • Which • Who • Why	• Classify • Compare • Contrast • Demonstrate • Explain • Extend • Illustrate • Infer • Interpret • Outline • Relate • Rephrase • Show • Summarize • Translate	• Apply • Build • Choose • Construct • Develop • Experiment with • Identify • Interview • Make use of • Model • Organize • Plan • Select • Solve • Utilize	• Analyze • Assume • Categorize • Classify • Compare • Conclusion • Contrast • Discover • Dissect • Distinguish • Divide • Examine • Function • Inference • Inspect • List • Motive • Relationships • Simplify • Survey • Take part in • Test for • Theme	• Agree • Appraise • Assess • Award • Choose • Compare • Conclude • Criteria • Criticize • Decide • Deduct • Defend • Determine • Disprove • Estimate • Evaluate • Explain • Importance • Influence • Interpret • Judge • Justify • Mark • Measure • Opinion • Perceive • Prioritize • Prove • Rate • Recommend • Rule on • Select • Support • Value	• Adapt • Build • Change • Choose • Combine • Compile • Compose • Construct • Create • Delete • Design • Develop • Discuss • Elaborate • Estimate • Formulate • Happen • Imagine • Improve • Invent • Make up • Maximize • Minimize • Modify • Original • Originate • Plan • Predict • Propose • Solution • Solve • Suppose • Test • Theory

Anderson, L. W., & Krathwohl, D. R. (2001). A taxonomy for learning, teaching, and assessing, Abridged Edition. Boston, MA: Allyn and Bacon.

Activity – Create a Problem

Course: Physics 121: Introductory Mechanics Course; Cap of 60 students; Primarily Sophomores, but have a handful of Freshmen and some Juniors.

Learning Goals:

- Construct, re-construct, and add to understanding and application of mechanics concepts
- Be effective problem-solvers and develop different approaches to and representations of the material
- Develop as a learner-educator: take responsibility for – and be active in – own learning, assist others to do the same, and develop effective study skills

Learning Outcomes:

- Identify and analyze misconceptions of mechanics concepts previously held in order to modify them and build on correct knowledge
- Analyze and solve physics problems using an expert approach in order to identify main concepts, logically progress through problems, and increase confidence and use of symbolic manipulation

Bloom's Taxonomy Level: Creation

Activity Description: In groups, students are expected to create a physics question for an exam. One question out of the pool of questions that satisfy the given requirements is then placed on the exam. The benefits of this activity are: students are operating at the highest level of Bloom's Taxonomy, they have to know and study the material in class to be able to create a question, they have to figure out what information to provide in order for someone else to solve the problem, they get to contribute to the exam (this results in few to no complaints about the exam), they realize the difficulty in creating a question, it hopefully encourages students to study more for the exam as they have access to all viable problems, I have permission to choose a difficult question (students will frequently come up with questions that are more difficult than the ones I would write), and it engages all students (body language changes when I've done this activity, in addition to verbal engagement).

Activity Implementation: Students are given an entire class period – 80 minutes – to create, and try to solve, a problem. For my physics course, the following requirements are given to the students: they must solve for only one variable/quantity, they must use at least three equations to solve for the one variable/quantity, the problem should describe a real-life situation or it should be creative, and they can't use a problem or example straight from their textbook, class, or the Internet. A problem-solving guideline also must be followed when the students solve the problem they created. Once these are turned in, I vet each one to make sure the problems both meet the requirements, and are solvable, i.e., contain enough information to actually solve. All of the viable problems are then typed onto individual PowerPoint slides with their answer, but not the solution, and posted as a PDF to the course Canvas site for review by the students prior to the exam.

Problem-Solving Guideline

The ability to solve problems is expected in any chosen profession. It also enables you to think critically about quantitative questions, information, or problems in your everyday life, e.g., trying to figure out how many pavers you need for your new, do-it-yourself patio. Showing the steps of your solution encourages you to logically order your thoughts and mathematical steps to enable yourself and others to understand your solution (communication learning goal). This rubric provides suggested steps to take when attempting to solve a quantitative problem, and in particular, a physics problem. For each step, you should always ask yourself <u>why</u> you're doing what you're doing, and everything should be written <u>clearly</u> and in a <u>logical order</u>. At any point in this process, use your resources when you get stuck: books, notes, internet, people, etc.

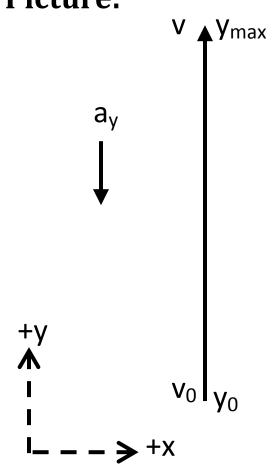
This process may seem very laborious initially, but as you practice, you will increase your efficiency, some steps will be automatically combined into one step, and the process will start to manifest naturally.

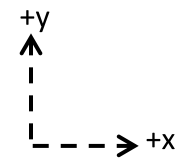
Note: Sometimes it may be easier to solve a problem with a slightly different order to these steps.

What to do	Why do it	How to do it	Example
<u>**Identify**</u> the problem within the larger context. With what <u>**concepts**</u> are you dealing?	• Identifying the over-arching concepts will help to narrow your focus on what will be important to solve the problem.	• Start with what the question is asking you to find. • Based on your studies, what main concept is involved? • What other concepts might be tied to this main concept?	**Question:** Upon graduation, a joyful physics student throws her cap straight upward with an initial speed of 14.7 m/s. What is the distance to the cap's highest point from where it was tossed? **Main Concept(s):** 1D motion with constant acceleration **Reasoning:** The problem tells you that the cap is thrown *straight upward*, and you've been given velocity information while being

			asked for a position (height).
Extract information. What do you know from the problem?	• This will help you figure out what equations you may need.	• This information can be obvious, e.g., the car was going 50 mph. • This information could be subtle or "hidden", e.g., the car started from rest. • Make a list of the info, WITH UNITS (and any applicable uncertainty), and assign a variable to each piece of info. • It's possible that you may need to look up information that you don't have. Use your resources: textbook, the Internet, collect your own data, etc.	**Information:** v_0 = 14.7 m/s, y_0 = 0 m, v = 0 m/s, a_y = 9.8 m/s^2 **Reasoning:** Initial velocity (v_0) is supplied in the question. You can make the initial position of the cap where it's launched (y_0) at any height; I've chosen 0 m to make it easier. The final velocity (v) is 0 m/s since the cap has to stop to turn around and come back down at its highest point. The acceleration the cap (a_y) experiences is 9.8 m/s^2 since only gravity is trying to pull it down, and that has a constant acceleration (adding a negative to the a_y is only true if downward is negative according to my chosen coordinate system).
What are you solving for? You need to know, and keep visible, the ultimate goal of the problem.	• This step, combined with the others, will help you figure out *exactly* which equations you will need • When solving a problem with multiple steps and/or parts, it's easy to lose track of this, or to solve for the wrong quantity! • You may have to solve for other quantities before you solve for your final	• Write down and *box* the quantity you're trying to solve for so that you can make sure that's where you end up.	**Solving for:** $\boxed{y_{max}}$, or max height in meters, m. **Reasoning:** The problem tells you what it wants in this case.

	variable.		
Figure out what **<u>assumptions</u>** need to be made.	• Assumptions are KEY to solving problems. • *Assumptions let you know when your solution will hold and when it will fail*! • These are made to simplify the problem you're solving. In any problem, physics-related or not, you will have to make simplifications. It becomes overly complicated and time-consuming to consider everything.	• Write down your assumptions. • In introductory physics classes, we often make many assumptions. • The assumptions should be such that not making them wouldn't change your answer enough to matter, e.g., your answer would only change by a few %, which should be ok for that situation. • Think about if there would usually be other interactions with your main object(s) in your problem in the real world.	**Assumptions:** That the cap goes straight up and down, that there is no air resistance, and that the acceleration of gravity is constant. **Reasoning:** The problem specifies that the cap goes straight upwards. Air resistance makes the problem much more complicated by introducing potential acceleration that could have multiple directional components; this is a fairly good assumption that shouldn't alter our results much more than a few %. The acceleration of gravity is constant enough that any variation will not greatly affect our results.
<u>Choose a system.</u> What objects are in this system?	• Any objects not included in your chosen system are considered "outside". This isn't to say they don't have influence, just that they're not "internal" to your system. • This helps you to identify what information you will still need to find before solving for your final answer. • This will also help you to define the interactions that are occurring, and	• Figure out what objects will be in your system, and which will not. Include them in the picture you draw. • This one takes practice, and there is often more than one way to be correct. It is often dictated by how much, and what kind of, information you have available. • If you end up without enough information to solve your problem, you	**Objects in System:** the graduation cap **Objects outside System**: everything else **Reasoning:** the question is only asking about a quantity related to the graduation cap, therefore, we only care about quantities related to the cap.

	how you're going to go about solving the problem.	may need to revisit this step, and expand your system.	
<u>Predict the order of magnitude or range of the answer</u>. This could include sketching a graph if the purpose is to draw an accurate graph.	• Predictions help you to remember, at least with physics concepts, that answers should fall within physical expectations, e.g., the temperature calculated for a drink should not be so hot that it could comfortably hang out on the surface of the sun. • Predictions help you to explicitly show your initial understanding of a problem. • They help you check your answer at the end to see if your initial understanding was incorrect, or if you made an error in your solution.	• Use your everyday experiences, if available, e.g., A car should reasonably move between 0 mph and 100 mph depending on the circumstances. • Write a brief explanation of your prediction so that you can think through, and later compare, your understanding of the concept before you solve the problem.	**Prediction:** Between 0 m and 20 m **Reasoning:** I doubt someone could through a cap much higher than this, and I assume the cap at least reaches a height above where it is let go from the student's hand.
<u>Draw a picture and/or diagram.</u>	• Problems can be fairly long and involved, or just confusing; pictures and diagrams can provide clarity. • In physics, you will frequently have one or more initial and final situations, and drawing each can help clarify your equations and steps.	• Draw the situation, or multiple situations based on the question description. • Include all relevant objects. • Label your picture with variables based on all the information you've been given, and the info that's hidden. • Include your chosen coordinate system.	**Picture:** 

Choose a **coordinate system**.	• Coordinate systems are an imaginary tool to help you organize your directions. • *It's your choice* which direction is positive and which is negative; which is x, and which is y. For 3D coordinate systems, x, y, and z are oriented according to the Right Hand Rule, but you can choose which direction will be x.	• Whether it's 1D, 2D, or 3D, you have options for your coordinate system. • You can use a traditional x, y, z system, cylindrical coordinates, polar coordinates, etc. • If needed, the coordinate system can be rotated to make the problem easier. • Once you've made the decision for that problem or part of the problem, *stick with it* for that problem! • Draw the coordinate system you've chosen directly on your picture.	Coordinate System:  (also included in picture above) **Reasoning:** I've chosen the usual representation of the coordinate system with up being positive y. I could have chosen up as negative y, it doesn't matter. With this choice, the acceleration will have a negative in calculations to indicate that its direction is downward (-y direction).
Figure out which **equations** and relationships between variables are needed.	• Relationships and equations were discovered through experiments and observations of patterns. • They exist so that you don't have to figure them out from scratch, but can use the relationships to find values of quantities.	• Given all the steps above, use your resources to figure out the equations you will need and write them down. • Make sure that the equations are consistent with your main concepts, assumptions, and your chosen system!	**Equations:** $v^2 = (v_0)^2 + 2a\Delta y$ **Reasoning:** I only have velocity, acceleration, and position information, and I want to know about a position. This is the only constant acceleration, 1D equation that contains this information without adding another unknown variable. I could also solve this problem using more than one equation.
Work in **variable form** to solve for your quantity	• Avoid errors by working in variable form. • Simplify equations before solving.	• It will be very tempting to start plugging numbers into the equations you've chosen; avoid doing this!	**Variable form work:** $0\ m^2/s^2 = (v_0)^2 + 2a(y_{max} - 0\ m)$

	• Easier for you and others to read over your work later.	• Use the variables you assigned when you identified the information needed for the problem. • The only quantities I recommend plugging in numbers for initially are those that are zero, since they often help to simplify equations. • Get down to one equation that solves directly for the unknown quantity about which the problem is asking.	$-(v_0)^2 = 2ay_{max}$ $y_{max} = -(v_0)^2/(2a)$ **Reasoning:** Replacing the variables that are zero simplified the equation. Δy is y_{max} minus the initial y. To solve for y_{max}, I needed to get the variable alone, so I subtracted $(v_0)^2$ from both sides, and then divided by (2a).
<u>Solve</u>	• You often want to get to a final, numerical answer WITH UNITS (and possibly uncertainty).	• Now that you have a simplified equation (or more than 1) with only one unknown variable on one side and known variables on the other, plug in your given information WITH UNITS and any uncertainties. • Box your final answer so that it's easy to find.	**Solution:** $y_{max} = -(14.7\ m/s)^2/(2(-9.8\ m/s^2))$ $y_{max} = (216.09\ m^2/s^2)/(19.6\ m/s^2)$ $y_{max} = 11.025\ m \approx \boxed{11.0\ m}$ **Reasoning:** I squared the top, and multiplied the numbers in the denominator, and then I divided to get the final answer. The answer was changed to 11.0 m to keep the correct number of sig figs.
<u>Check your answer!</u>	• *Don't assume you're done just because you obtained a number.* • It's not uncommon to make mistakes during the	• <u>This step is important</u>, and also frequently overlooked. • First, check to make sure that your answer solves	**Check:** I solved for y_{max}. $m^2/s^2 \div m/s^2 = m^2/s^2 \cdot s^2/m = m$ The answer is within my

	other steps. Checking your answer will help you identify if you made mistakes.	the goal you boxed. • Check the units when you solved for the quantity: do the units add, subtract, multiply, and/or divide to give the correct units for your quantity? • Does the answer make physical sense? • If there's something you can change about a quantity that the answer depends on to make the situation more familiar, do so and see what happens to the answer. Did it change as you expected? • Finally, check your answer against your prediction. Does it match? • If not, determine if you made an error in your prediction, or an error in your solution. • *This is a really great step for which to have a study partner*!	predicted range, and it makes sense that the cap flies about 11 m given it started with an initial velocity of 14.7 m/s which seems a little high for someone throwing a cap (~33 mph), but not completely unreasonable.