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| MSPLesson Plan |
| **NAME: Jenifer Brown, Robert McLellan** |
| **SUBJECT/GRADE RANGE: 11th Physics/Earth-Space Science** |
| **TOPIC: Waves Trans/Long – prerequisite lesson on types** |
| **List of appropriate standards that support the lesson.*** PS4-1
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| **List of appropriate objectives that guide the lesson.*** Students will be able to describe transverse and longitudinal waves
* Create a model of each wave type and their parts
* Investigate relationship between frequency, wavelength and speed. (V=fλ)
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| **An equipment list in table format, stating the quantity and source for each item.**

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| Equipment | Quantity | Source |
| Coil springs | 5 | Flynn Scientific $27/ea (AP9023) |
| Stopwatch | 5 |  |
| Meter stick four-sided | 5 | Flynn Scientific $15.05 (AP4788) |
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| **List of safety requirements for your lesson. (when applicable)*** Spring, if used incorrectly, could be a hazard (Don’t be stupid)
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| **A detailed plan of instruction including activities, timeline, and questions you plan to ask students.**

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| ***Engagement*** |
| Timing | Activities | Planned Questions & Expected Answers/Misconceptions |
| 10 min | Wave race – in hall using long, connected coils have a volunteer student to race the pulse. (and/or ball rolled or thrown) | Make a prediction who will win the race and why.Depending on results, what could be done to change the speed of the pulse? |
| Demonstrate both transverse and longitudinal | What could we measure to calculate how fast the pulse is? |
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| ***Exploration*** |
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| Timing | Activities | Planned Questions & Expected Answers/Misconceptions |
| 30 min | Students will use coil springs to investigate the factors that affect the speed of waves and use calculations to show how to speed up or slow down the wave pulse, if possible. (students may use electronic device to video if needed for slo-mo evaluation of the waves) | Q. Can you identify the different parts?Q. Is there a relationship between the frequency and wavelength?Q. What did you do to add energy to the wave?Q. What happens to the motion of the spring if you do not touch the spring?Q. Can you identify the direction of the disturbance and direction of the wave? |
| Try to make several “waves” in the spring at one time. | Q. What allowed many “waves” at a time?Q. Compare  |
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| ***Explanation*** |
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| Timing | Activities | Planned Questions & Expected Answers/Misconceptions |
| 15 min | Make a model of each wave (Trans/Long; high and low frequency) and label/describe different parts on your white board. | Q. Can you list the partsQ.  |
| Each group presents their models and describes their reasons for difference in models.  |  |
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| ***Elaboration*** |
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| Timing | Activities | Planned Questions & Expected Answers/Misconceptions |
| 10 min | Once students explain their speeds and wave models, return to group work and repeat experiment using wavelength and frequency to calculate speed. Then compare to the speed calculated by using distance and time measurements. | Q. What is the relationship between wavelength and frequency?Q. Can you distinguish between Trans/Long?Q. How could you determine frequency using lab procedure? |
|  | Q. How can you determine a number for the amplitude using lab procedure? |
| Return to classroom to discuss additional lab data. | Q. Was another group’s procedure better than yours? Why? |
|  | Q. Based on what you know now, why are UV rays more damaging to skin than radio waves? |
| ***Evaluation*** |
| See below |

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| **Assessments. A copy (or description) of how you will assess whether the students have achieved your objectives along with a key showing how you will evaluate responses.** |
| **Any visual aids and handouts that you will use.** |