# Technology-Connected Lesson Plan

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| Lesson Plan Number (Check one box) | 1 | 2 | 3 | 4 | x |
---|---|---|---|---|---|

**Name:** Mahdi Ibrahim  
**School:** Southside Comp. High School

<table>
<thead>
<tr>
<th>Lesson Title:</th>
<th>Optics: Refraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade Level/Subject Area:</td>
<td>9-12/Physics</td>
</tr>
<tr>
<td>Student Profile:</td>
<td>Number of Students: 25</td>
</tr>
<tr>
<td></td>
<td>Number of Students with Special Needs: 0</td>
</tr>
<tr>
<td>Area of Specialties:</td>
<td></td>
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<tr>
<td>Performance Objectives:</td>
<td>After completion of the lesson, students will be able to: (use action verbs)</td>
</tr>
<tr>
<td></td>
<td>• Collect data of a simulated experiment relating the angle of incidence, and angle of refraction for materials of different optical densities (air, water, crown glass, diamond, etc.)</td>
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<tr>
<td></td>
<td>• Draw a bar graph of the acquired data using Excel, and compare the angles of incidence to the angle of refraction of the materials tested.</td>
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<td></td>
<td>• Given a material with optical density between glass, and diamond, predict the angle of refraction based on the experimental data</td>
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<tr>
<td>Curricular Connections: (QCC/IEP/Local or National Standards)</td>
<td>12.2 Describes reflection, refraction, diffraction, and interference.</td>
</tr>
<tr>
<td>Assessment:</td>
<td>Please refer to the attached student self-assessment, and teacher assessment</td>
</tr>
<tr>
<td>Technology Connections:</td>
<td>Internet, computer, Word, Excel</td>
</tr>
<tr>
<td>Materials:</td>
<td>Computer, internet, Excel, Word, scientific calculator</td>
</tr>
<tr>
<td>Related URLs:</td>
<td><a href="http://www.geocities.com/capecanaveral/hall/">www.geocities.com/capecanaveral/hall/</a></td>
</tr>
</tbody>
</table>
| Procedures: (Please number your procedures.) | Whole Group:  
Introduction – The whole group will participate in the simulated online lab involving refraction.  
1. Teacher accesses the website and run the simulation lab  
2. The students will copy the simulated data generated by the program relating the angle of incidence to the angle of refraction for different media (air, water, glass, diamond, etc.)  
3. The students copy the index of refraction for each media used, and also the resulting angles of refraction for angles of incidence ranging from 10 to 70 in the increment of 10) |
| Small Group: 1. Students are then grouped in small group of 4  
2. Using word, and Excel each student draws a graph relating the angle of incidence to the angle of refraction for each of the medium used (water, glass, diamond, etc.) |
| Cooperative Group:  
Individual:  
1. Using the data, each student verifies Snell’s Law of Refraction  
2. From the data and the graph, make prediction of the angle of refraction of a given medium (ex. One whose index of refraction is between water and that of glass, etc.) |
| Classroom Management:  
Technology Management Strategy: |
| Instructional Groups: Whole Group, Small Group, and Individual |
| Accommodation (Lesson Plan #3 only): |
Lesson Implementation and Assessment Form
(this form is to be completed by the InTech Participant and submitted with each of the four required lesson plans)

**INTech PARTICIPANT:**

**CURRICULAR AREA(S)/GRADE LEVEL:**

**SCHOOL:**

**PHYSICS/9-12**

**DATE(S) OF LESSON:**

**7/21/04**

**Lesson Plan Number**

<table>
<thead>
<tr>
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<th>1</th>
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<tbody>
<tr>
<td>Whole Group</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Individual</td>
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<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Small Group</td>
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<td>X</td>
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</tbody>
</table>

**Cooperative Learning**

Please check the new design(s) for teaching and learning used in this lesson:

<table>
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<tr>
<th>Whole Group</th>
<th>Individual</th>
<th>Small Group</th>
<th>Cooperative Learning</th>
</tr>
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<tbody>
<tr>
<td>x</td>
<td>X</td>
<td></td>
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**Did you use the Internet as an integral part of this lesson?**

- [x] Yes
- [ ] No

**√ Meets Standard**

**Lesson Plan Criteria**

1. **Lesson Plan**
   - All elements of the InTech Technology-Connected Lesson Plan template are addressed in typed form
   - No spelling or grammatical errors are present

2. **Performance Objectives**
   - All objectives are clearly written in measurable terms
   - Technology is used to accomplish the objectives

3. **Curricular Connections**
   - QCC Standards (K-12) are present
   - Or Local or National Standards (Pre-K) are present
   - Or IEPs (Special Education Objective) are present

4. **Assessment**
   - An implemented copy of the teacher/student assessment instrument, reflecting the performance objective, is included, if appropriate OR
   - Explanation of other assessment methodology is included in the lesson plan

5. **Materials**
   - The material and equipment (paper, pencil, handouts, etc.) are listed
   - The technology connection (hardware/software) is listed

**√ Participant Self-Assessment**
### Procedure
- Directions and procedures are written clearly and accurately

### Classroom Management
- Strategies are included for instructional groups and technology management

### Student Work
- Authentic student work (at least one example of each completed product described in the lesson procedures and reflecting the performance objective)

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(continued)

Please respond to each item below.

**Lesson Plan Implementation Item**

In planning, the time allowed for the activity was appropriate. Why or Why not?
Yes. It was done over two periods.

The supply of resources and materials was sufficient for the activity. Why or Why not?
Yes. The students have to use different computers.

Learning activities were enhanced by technology. Why or Why not?
Yes. It was interactive, visual, and meaningful to the students.

Students met performance objectives. Why or Why not?
Yes. They completed the experiment, and the chart as described in the rubrics.

Students were engaged in the learning task. Why or Why not?
Yes. Because it was interactive.

Equipment and software functioned properly. Why or Why not?
Yes. Well maintained computers.

Implementation of this lesson plan was successful. Why or Why not?
Yes, because the students performed as expected.

**What modifications are needed to improve this lesson plan?**

Automated data collector and graph plotter could be used, but I fear the students will lose the interaction, and possibly interest.

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In reflecting on your teaching, what components of the lesson did and/or will require additional planning and preparation?

**Whole group activity assigned to smaller group or individual**

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Will you repeat this lesson? ___X___ Yes  _____ No
InTech Instructor Comments and/or Notes:

Comprehensive high School, Atlanta, GA
Teacher-Assessment
Assessment

Name Date________________

The following scale will be used to see how well a student did
Excellent - Followed all the instruction and completed the assignment neatly. Best effort
Good - Tried to follow instruction and do the assignment neatly, but the student came short of performing superior
Bad - The student didn't follow instruction and there is a lot of room for improvement.

4. The student copied the simulated data generated by the program relating the angle of incidence to the angle of refraction for different media (air, water, glass, diamond, etc.)
   a. Excellent       b. Good        c. Bad

5. The student copied the index of refraction for each media used, and also the resulting angles of refraction for angles of incidence ranging from 10 to 70 in the increment of 10 degrees
   a. Excellent       b. Good        c. Bad

6. The student used Word, and Excel to draw a graph relating the angle of incidence to the angle of refraction for each of the medium used (water, glass, diamond, etc)
   a. Excellent       b. Good        c. Bad

7. Using the data obtained from the experiment, the student proved/verified Snell’s Law of Refraction is correct
   a. Excellent       b. Good        c. Bad

5. From the data and the graph, the student was able to make prediction of the angle of refraction of a given medium (ex. One whose index of refraction is between water and that of glass, etc.)
   a. Excellent       b. Good        c. Bad