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Minds-on Audio Guided Activities: Teaching the Coriolis Effect

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iPods have entered the academic arena at Central Michigan University. Under the "iTunes U" program (see **http://www.cmich.edu/itunesu/**), students may use iTunes and their personal iPod to download and listen to recordings of lectures. Although this is certainly a welcome inclusion of technology and one that may benefit instruction, students using "iTunes U" are not necessarily actively involved in the learning process. It is under this premise that we have attempted to develop a use of audio aided instruction that involves active learning by students.

Our main goal is to have students "experience the physics" by having them learn about a physical concept through engaging in activities usually outside a classroom setting. The audio guide leads the learners through the activities but the pace of the delivery as well as the discussions that may arise are mainly under students' control. In other words, instead of simply hearing about the concept passively while sitting in a lecture hall, a student will feel or see it in action in a real life environment. It is our hope that a student learning in this manner will develop a physical insight and extend the concept retention. In developing this idea, we have chosen to focus on one particular concept in physics, the **Coriolis Effect** which allows extensive comparative assessment of the Minds-on Audio Guided Activities concept (MAGA) that we are developing.

In selecting a test concept, we decided to choose one that was not always included in an introductory level college physics course. In doing so, we wanted to be certain that we could strictly control whether or not the material was learned from the MAGA. In physics this MAGA is suitable for very different levels of instruction ranging from conceptual physics to advanced mechanics.

The Coriolis Effect lends itself particularly well to MAGA because one of the best ways to observe it is by playing on a merry-go-round which stresses the "learn while experiencing" approach. The Coriolis Effect is the apparent deviation from a straight path observed from a rotating frame of reference and it is introduced in a variety of courses including geography, meteorology, and physics (PHY 145, MET 201, etc.)

The Coriolis Effect can be observed on a merry-go-round by various means. One can roll a ball or walk on the merry-to-round while it is spinning. We developed a script to help the learner to discover the Coriolis Effect by guiding them through activities that ask them to make observations about forces they feel on their bodies and the effects that they notice. In this particular activity, students are asked to work in pairs and to take a short pre-test before the activities (we have designed a pre- post-testing assessment). Once they have arrived at a merry-go-round, students will begin listening to their audio players. The script is set up so that they may listen for instruction, stop, and then proceed to the next track once they have completed the task or observation as delivered to them by the audio player. Additionally, once a task is completed, students are asked to discuss the results with their partner, and, upon reaching a conclusion between them, to proceed to the next track to hear an explanation of the observed effects. The script is developed in a scaffolding style so that each activity builds upon the previous one, leading students to explore and develop conclusions about the Coriolis Effect based upon their observations. A short post-test should be completed afterwards.

We plan to collect data in the fall and are looking for instructors that may be interested in using this MAGA in their classroom. The MAGA can be completed in a week and is self-contained; it can be used from high-school to graduate level. Traditional learning gain analysis will be performed to test the MAGA instruction.

For convincing data analysis, in addition to the MAGA group, a control group of students will learn about the Coriolis Effect in a traditional lecture setting. The students in the lecture format will be taught the same material as the exploration students, however, through a lecture style lesson. An instructor guide relating the various methods and content covered in the audio exploration was developed. It is our hope that the MAGA will prove to be a good instructional tool to be paired with more traditional lecture style.

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