

Applying Real-World Learning through Amusement Parks to Help Teach the Upcoming Changes to Utah Core Standard

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Abstract

To assist educators in satisfying the Science with Engineering Education (SEEd) Standards the Utah State University (USU) Physics Department has developed a curriculum centered around USU Physics Day at Lagoon.

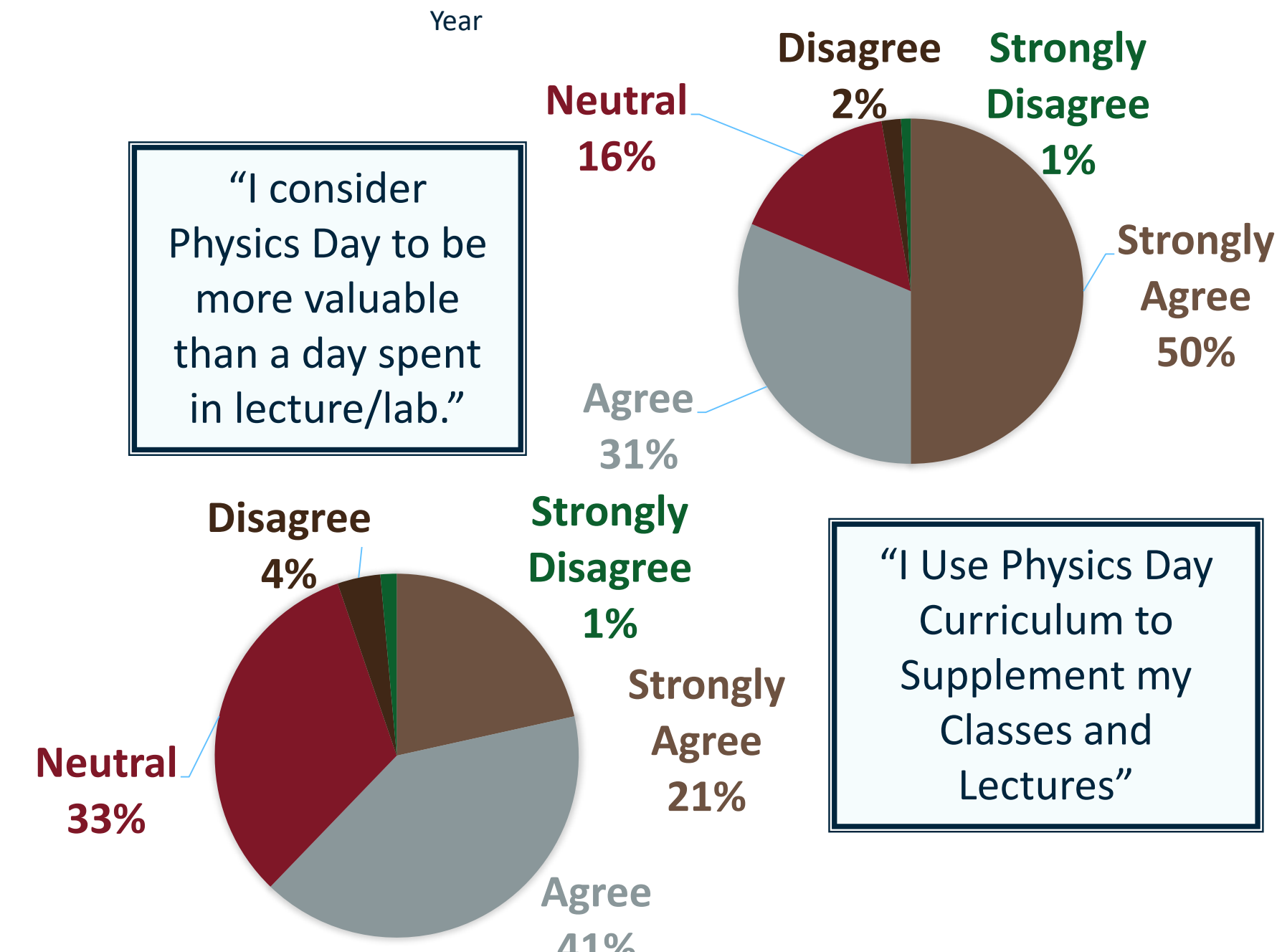
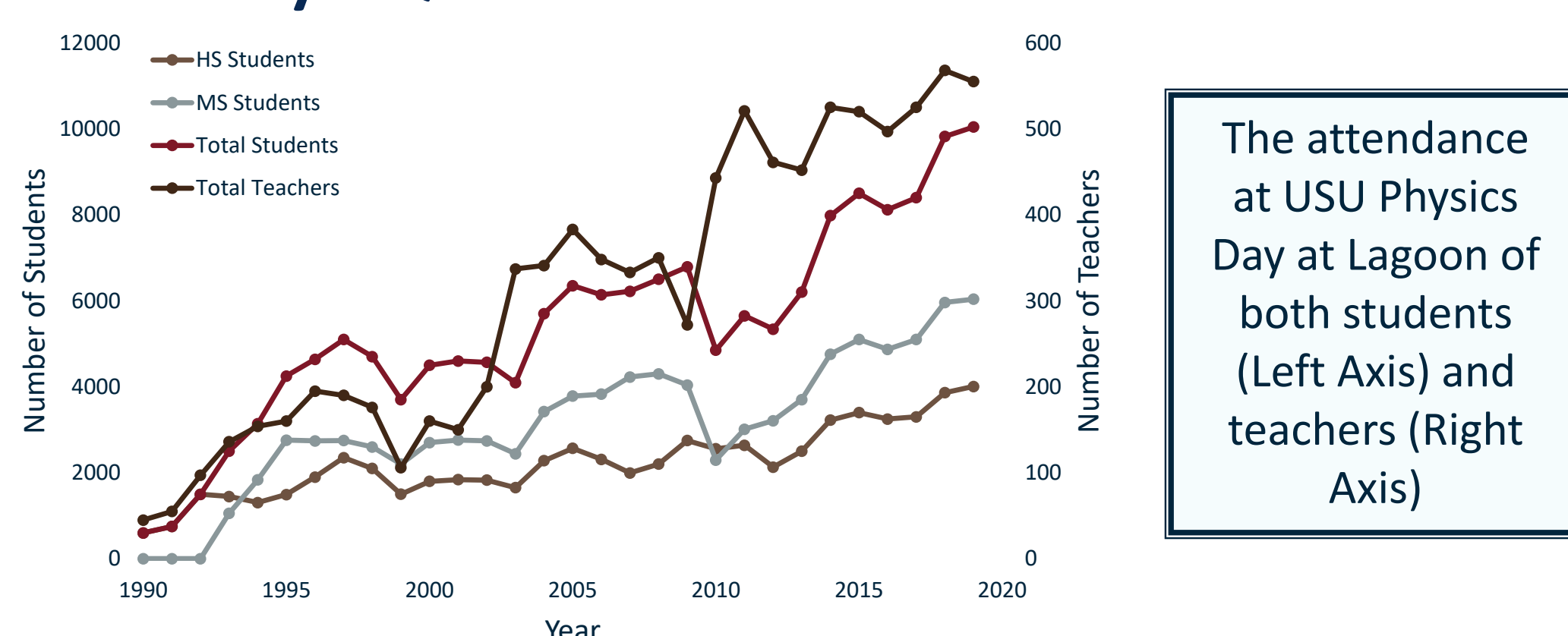
With an upcoming change to Utah's core standards and a shift to more hands-on learning styles, the use of real-world learning offered by amusement park applications is analyzed in its ability to satisfy the Utah State Bureau of Education's (USBE) SEEd standards. Amusement park learning allows educators a vehicle to capture students' attention in the classroom by discussing science principles in a fun and exciting manner with a promise of application rather than through tired word problems or rote memorization.

Utilizing the amusement park as a source of data allows for a truly exciting lab experience, and the opportunity to make associative memories between science and the fun had at an amusement park. By bringing data acquired at Physics Day back to the classroom, students can verify preliminary findings and cement those principles which they learned in the classroom and tested in the park. This learning approach enhances student retention, satisfies new core standards, and allows students the opportunity to continue their learning outside of the classroom.

Student Contests for USU Physics Day at Lagoon

- Demonstration Design
- Ride Design
- Logo Design
- Sky Drop
- G-forces
- Student Workbooks
- Smart Phone
- Physics Bowl

Educator's Response to Annual Survey Questions



Background

Every year educators are encouraged to participate in a survey about their Physics Day experience. The consistently increasing numbers of teachers and students attending the event show that veteran educators have found value in bringing students to this event. Looking only at data for Physics Day at Lagoon in 2019, of the 139 survey responses from the teachers only 17 (12%) were new to the event; such high repeat attendance confirms value attributed to the event by teachers.

Looking at results from all survey responses from all years, A specific survey question asks: "I consider Physics Day a good use of my time." This question is significant as it addresses one of the most important resources that educators have, class time. Good educators will jealously guard their instruction time with students often having resentment for assemblies, other class field trips, and other non-essential activities that remove students from class. The results from this question show that most educators value the time at Lagoon as time well spent. We specifically ask educators if they "consider Physics day to be more valuable than a day spent in the Lecture/Lab." Only 3% of responders felt that they could do more for their students in providing a memorable teaching experience in their classroom than could be achieved with a day at Lagoon.

One of the most telling questions asked is "I use Physics Day curriculum to supplement my classes and lectures." The responses that have been received while positive, indicate the possibility for improvement. Only 62% of educators indicate that they use the Physics Day curriculum in their classroom. This strongly suggests that enhancing the Physics Day educational curriculum is where our efforts should focus.

Utah SEEd Standards

The Utah State Board of Education (USBE) has established specific core standards to be met by all K-12 students to graduate from Utah's secondary schools. USBE regularly updates the Utah Core Standards and allows for parents, teachers, and local school boards to control the manner of presentation of those standards.

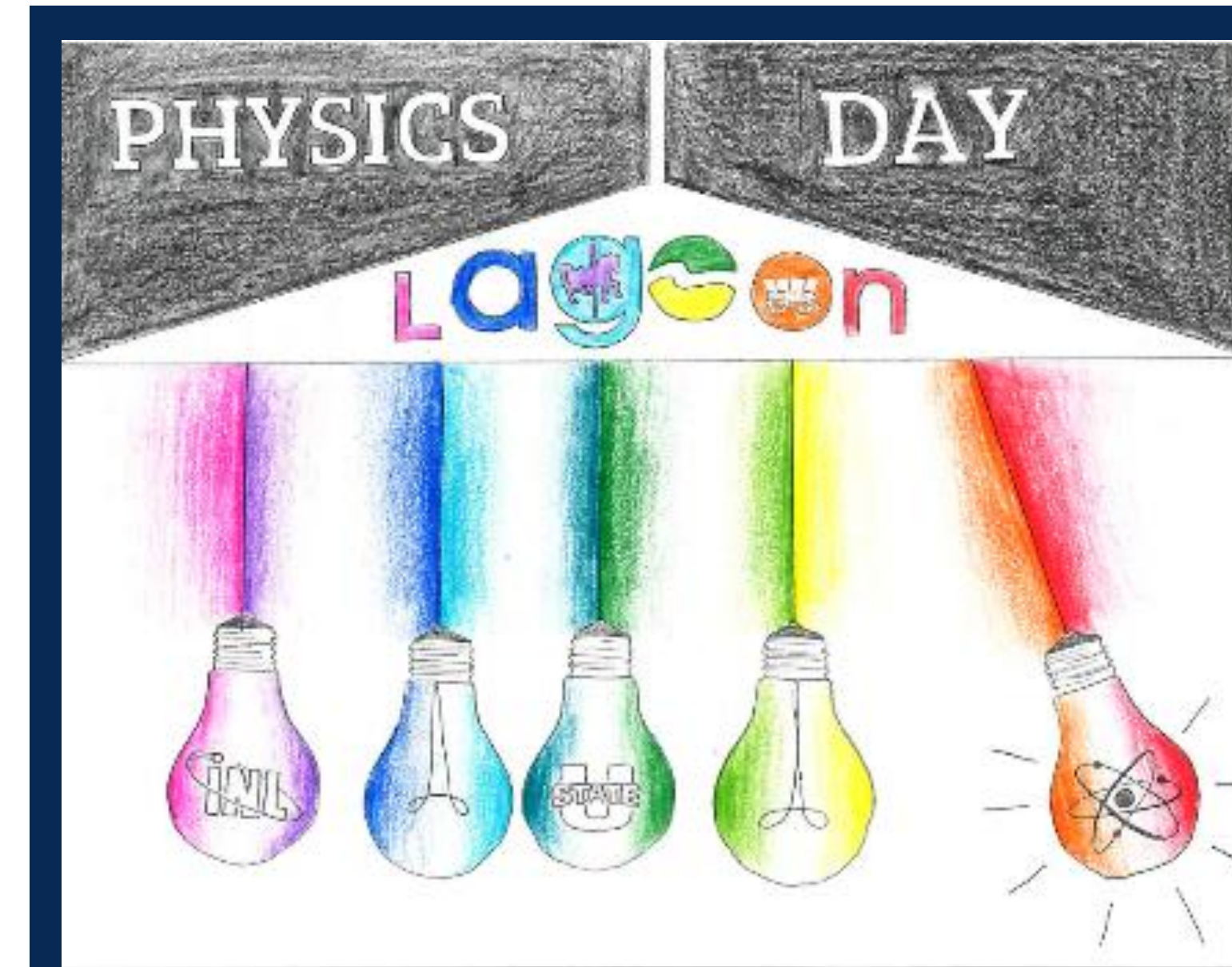
Utah's Science and Engineering Education (SEEd) standards were written by Utah educators and scientists, using a wide array of resources and expertise. The purpose of these standards is to move away from checkbox style learning objectives, and instead move towards active learning standards which will allow students to more effectively use scientific reasoning, and facilitate future recall of specific scientific principles.

A key aspect of the SEEd standards is that students become "Active" learners. Students can become active through observations, reasoning, and communicating with others. There are three main education principles (dimensions) that educators pay attention to when working towards helping students become active learners. They are:

- Science and Engineering Practices (SEP's)
- Crosscutting Concepts (CCC's)
- Disciplinary Core Ideas (DCI's)

USU Physics Day at Lagoon offers a fantastic opportunity to touch upon all of these education principles. Through participation in the Physics Day student contests, many of the SEP's which students initially learned in the classroom are reinforced. For example, "asking questions and defining problems" and "obtaining, evaluating, and communicating information" are principles which come up in each contest.

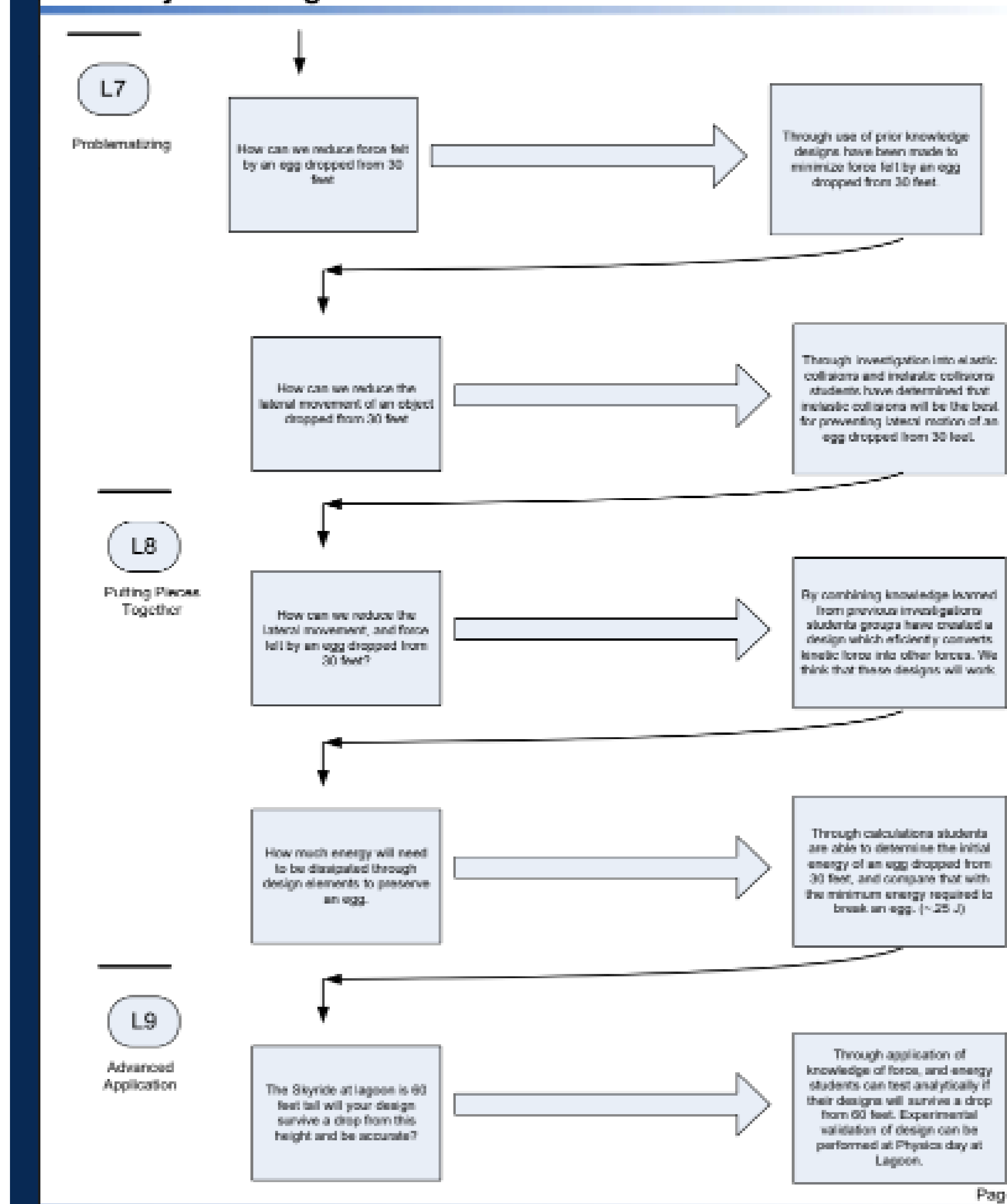
To better assist educators we have evaluated our efficiency at addressing SEP's, CCC's and DCI's and identified ways to more efficiently address them. We have worked to develop/improve curriculum for before students attend Physics Day, during their participation and after students return to the classroom. An example lesson for the Egg Drop contest is shown to the right. By emphasizing hands-on student discovery. Special attention can be given to the SEP's associated with: defining and using models, analyzing and interpreting data, and communicating information. This can all be done while emphasizing the CCC associated with Energy analysis and the DCI associated with the law of conservation of energy.



Winner of the 2019 Logo Design Contest:
Artist-Cailyn Orton & Tanner Schuster
School-Bonneville High School
Advisor-Devon Wakeman

Egg Drop Curriculum

Minimizing the impact of force on an object during a collision



Curriculum has been developed to assist teachers in preparation for discussions before and after activities at Physics Day at Lagoon. Above is a portion of a lesson series developed to introduce Newton's Laws, conservation of energy, and highlight the iterative process of engineering design. Featured (Left and Right) are students testing their final Egg Drop Design.



IV. Conclusions

Trends in education are constantly changing (Brooks 2019). To remain relevant and provide the greatest service possible Physics Day at Lagoon remains ever vigilant in our efforts to upgrade our curriculum to match that of our state educators (Lundgreen and Dennison, 2019; Dennison et al., 2019; Maughan and Lundgreen, 2020). By providing curricula which highlight the three dimensions of active learning USU Physics Day at Lagoon allows students an opportunity to experience first-hand the principles which they learned in the classroom in an exciting environment and continues to provide value to educators as an experience "more valuable than a day spent in lecture/lab."

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Advances to USU Physics Day at Lagoon curriculum have been funded by a UNSGC Higher Education grant. We appreciate additional contributions over the 31 years of the event to support Physics Day by members of the UNSGC, including: Boeing, Hill Air Force Base STEM Outreach Program, Hill Aerospace Museum, Idaho National Laboratory, IM Flash Technologies, Lagoon, Northrop Grumman-Thiokol, USU College of Science, USU Physics Department, and USU Space Dynamics Lab.



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