

# Fall 2024 EnVision Conference: Grand Design Challenge

## OVERVIEW

The Grand Design Challenge (GDC) is an engineering design challenge for middle school students which serves as a stepping stone for aspiring engineers. The GDC's purpose is to help ignite students' passion for STEM fields and provide a glimpse into the exciting possibilities of engineering and design. The challenge will be held on October 19, 2024 during the Fall 2024 EnVision Conference.

The GDC aims to teach students that different building materials and construction choices can dramatically impact the longevity of structures when tested against the natural elements. Students will not only be provided with a set of general guidelines and procedural steps, but will also have to consider the following while designing their solution: optimal materials, height requirements, budget, and other engineering factors. These constraints will encourage students to think critically and make strategic decisions during the design process.

Students can experiment with different material properties, structural design, and other engineering elements to achieve better results. A specific budget of "GDC cash" (fake bills) will be given out to every team. Each team must use the "GDC cash" to "purchase" materials of their choice from the stash of structural materials provided. This concept was introduced to demonstrate the reality that all engineering projects must comply with a given budget. While elementary students are participating in other activities, Grand Design Challenge students will be completing the challenge over a 2 hour 30 minute time period during the conference. GDC participants will be placed in groups of 3-4 students in order to complete the challenge. All necessary materials will be provided on the day of at no additional cost. The GDC will run as follows: a short explanation of what the challenge entails (including its engineering principles), individual student design sketching time, team brainstorming, build-time, and final competition and scoring. A prize will be awarded to the team who demonstrates the best understanding of engineering principles in addition to the team(s) who win the challenge overall.

## OBJECTIVES

In this activity, students will be using concepts typically found in an introductory physics course such as conservation of energy, Newton's laws, and potential and kinetic energy. Additionally, knowledge of material science-related concepts such as stress and strain will prove

useful. Students will be tasked with creating a structural solution to a real world problem and providing a verbal explanation which showcases their solution.

It is encouraged to have a basic understanding of these physics topics for this competition, as extra points will generously be awarded to those teams who are able to describe how their solution relates and/or capitalizes on the principles and concepts listed above. In addition, extra points will be awarded to those teams who remained within their given budget.