Title: Origami chair: Always accessible to everyone, everywhere

Name: Chiyo Nakatsuji
School: Oin High School
Place: Bunkyo city, Tokyo, Japan

As the global population continues to increase and natural calamities grow more severe, the pressing issue of inadequate seating in educational institutions poses a significant obstacle to students' learning experiences. To address this, I decided to develop a cost-effective solution aimed at facilitating the creation of robust and comfortable chairs accessible to all, thereby fostering enhanced educational outcomes and overall quality of life. Employing cardboard boxes as the primary material, I devised a straightforward manufacturing process inspired by principles of origami engineering and biomimetics.

My initial focus centered on the prism shape, renowned for its ability to fold from one side while maintaining structural integrity from another. Subsequently, I explored minimalist configurations derived from this fundamental shape. Through rigorous theoretical analysis and practical experimentation, I examined the buckling thresholds of various geometries, ultimately discerning that a "ribbon-type" structure offered the optimal blend of simplicity, durability, and foldability. Notably, this represents a pioneering approach to crafting foldable chairs from a single cardboard box, complete with backrests and arm supports. Comprehensive stability and strength assessments conducted on the seat and backrest confirmed compliance with ISO standards, demonstrating resilience in supporting loads exceeding 130 kg while weighing a mere 670 g. Consequently, the design facilitates effortless customization by individuals of varying skill levels. Moving forward, my aspirations include further refining this innovation to provide critical aid in disaster-stricken regions and alleviate educational resource deficiencies in impoverished school settings.