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# Making Meaningful Connections with STEAM for Elementary Aged Students in China

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## Abstract

This program included a summer STEAM experience for over 130 Chinese elementary aged children. During the week they constructed and tested an egg drop package, explored the local natural history museum, learned about animal footprints and the habitats they live in, dug up dinosaur fossils, and launched rockets. For many, this was their one of their first formal experiences with STEAM activities. The experiences provided a positive introduction or continued support for STEAM at the primary level.



## Keywords

STEAM, China, Elementary, Primary

# Making Meaningful Connections with STEAM for Elementary Aged Students in China

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During a 2021 summer program over 130 Chinese elementary aged students engaged in a week of STEAM activities. Though STEAM summer camps are commonplace in the US and other western nations, STEM and STEAM are relatively new concepts in China where elementary curriculum is involved. So much so, that STEM was only been introduced as an optional means of supporting the elementary curriculum in the spring of 2017 (Ministry of Education of the People's Republic of China, 2017). The facilitator opted to promote STEAM rather than STEM alone as they firmly support that art integrates well with the other 4 areas as both mutually instrumental and pedagogical (Mejias et al., 2021).

Groups of children were divided by language ability as some sessions were conducted in an English only format and some were dual language which included a Chinese translator. The students were all elementary aged though ranged from first grade up to sixth grade. A number of university volunteers supported instruction who were both Chinese and international students from Ghana, Mauritania, and Pakistan all majoring in education programs. Translators were Chinese education masters' degree students who were paid for their work. A total of 6 separate sessions were offered over the summer.

For the first day of activity the children participated in an egg drop competition within small groups of 3 to 4. The context of the egg drop was that package delivery companies all around the world are currently testing drone delivery systems. The goal was to design a container that would allow a raw chicken egg to survive a drop from a two-story height. Upon completion of a design based on a variety of available materials, students built and tested their containers. Examples of materials would be cardboard, Styrofoam, tape, plastics, paper, etc. In order to be considered as a possible winner the egg needed to survive the fall unbroken. Weight of the container was also a consideration along with how quickly (speed) it could be delivered. Ultimately, the fastest and the lightest package teams were identified as winners. Only one time did that include the same team for both categories.

Although it is not necessary for all STEAM lessons to touch on all five aspects every time, this particular activity does. Student were able to see connections to science as we discussed gravity, air resistance, and mass. Technology was touched on as the context was a package prototype for a drone delivery system. Unfortunately, it was not feasible to use an actual drone for the package drops, but that would have strengthened this further. Engineering was seen as the students not only designed but build functional containers for use. Art was relevant through the student design process and final products. Math played a key role as weight and time were measured and necessary to identify the top package designs.

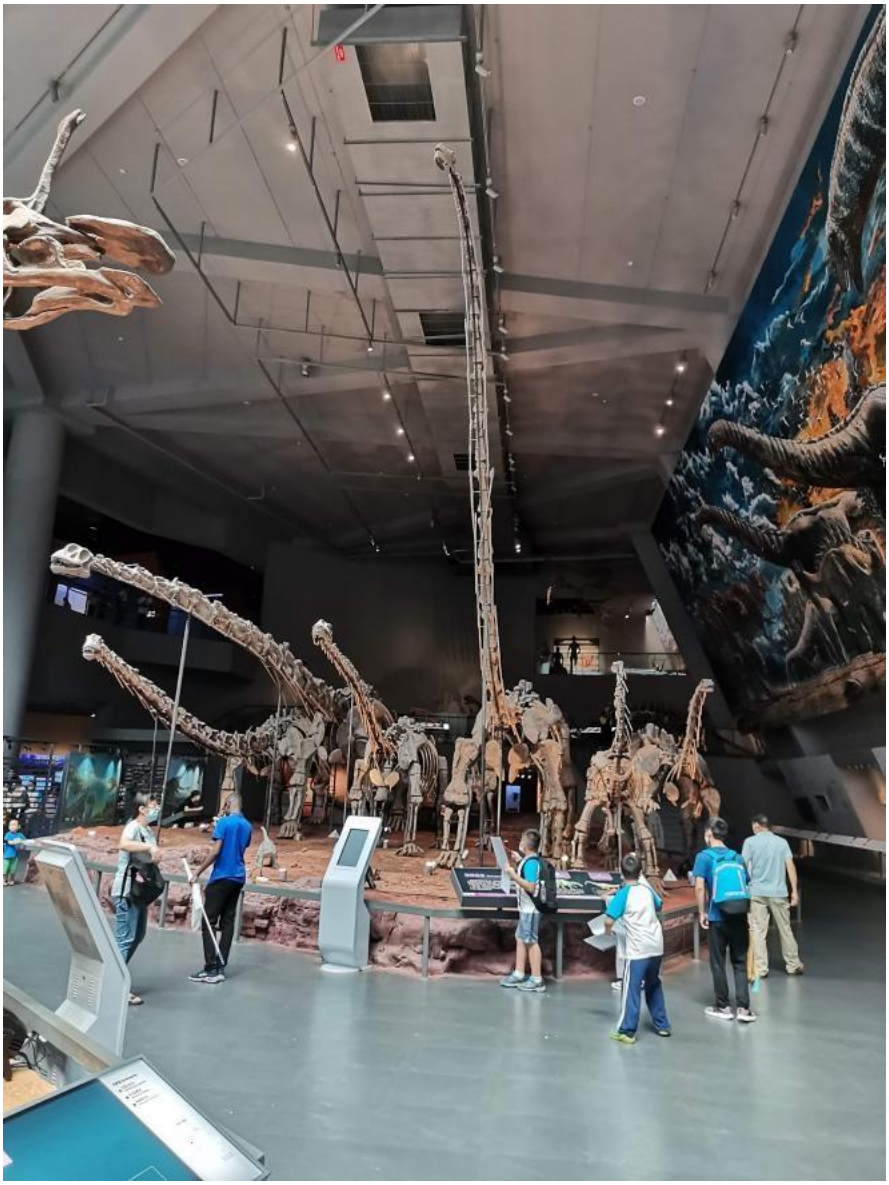
The second day of this summer experience was centered around the usage of a massive local resource, the Chongqing Natural History Museum. The museum is over 30,000 square meters and hosts 7 exhibition halls including Chongqing, Animal, Dinosaur, Earth, Environment, Evolution, and a changing special exhibit. Children were broken into 3 large, supervised groups which could then be divided into whichever size sub-groups participants desired. Large groups ranged from around 8-10 and subgroups 1-10. As a large group students would move from hall to hall answering questions in a scavenger hunt. The scavenger hunt was intentionally designed to take longer than the allotted time as individual teams would be scored on their correct answers. Scavenger hunt questions varied in difficulty and were

weighted accordingly. This particular activity had questions that would be relevant to the science behind several concepts found in the museum. Art was present as some of the items asked the students to draw some of the items they would find, as well as a design your own exhibit task. Math was prevalent as items were weighted, a time limit was in place, and several questions required equations or tallying to complete.

Day three tied in specifically to the Animal Hall experiences where students were shown a wide variety of animal footprints they then identified and measured. Animals ranged in terms of size, species, and which part(s) of the world they might be found in. The day continued with discussion on what habitats are and which habitats those animals lived in. Activities concluded with the children drawing animals of their choice, which could be based on the animal hall or from a variety of books on hand and adding them to a class set of habitat posters. Habitats were kept on the basic end including arctic, forests, mountains, oceans, and deserts. Activities for this day touched on a variety of biology and geography aspects. Art was a strong aspect of the habitat posters. Math was seen through the measurement of the footprints and also in the habitats as it was frequently asked which were the most/least seen animals and how many.

The fourth day tied into the Dinosaur Hall where students dug up dinosaur skeletons (plastic fossil models) from sand pits. To make it more challenging, each pit contained one of each of the six different dinosaurs and the students needed to identify which bones belonged to which. Bones were purposely scattered throughout different parts of the fossil pits. Students were only allowed to retrieve and clean one bone at a time. Once skeletons were assembled the students then drew a picture of their

dinosaur skeleton. Students then traced an outline of their skeleton on another piece of paper and then drew their dinosaur with skin. Finally, for those who had time, they compared and contrasted their dinosaur to a different dinosaur one of their classmates had. Students got to practice as beginner archaeologists digging and cleaning the fossils. They also worked as paleontologists identifying which bone belonged to which dinosaur along with its assembly. Technology was light but discussed through the aspects of how these scientists located, extract, and care for fossils, as well as, how they would determine what dinosaurs may have looked like in real life as we only see fossils of their bones today. Aside from the assembly of the dinosaur model engineering was not present. Art was abundant in the inside outside views of the dinosaurs. Math played a limited role in bone counts, and some chose to add dinosaur facts like dates to their drawings when time allowed.



The week concluded with students designing and launching their own high powered air rockets. Participants learned about the parts of a rocket, air pressure, and how to track the altitude of an object in flight. In order to not too drastically exceed building height, PSI was kept at 50. Concern was over landing rockets on top of roof spaces as these were launched in an urban area. Once pressurized using a bicycle pump, each student was able to launch their rocket by depressing an electronic firing button. Using altitude tracker constructed from printouts provided in a NASA Jet Propulsion Lab stomp rockets activity (https://www.jpl.nasa.gov/edu/teach/activity/stomp-rockets/) students were able to measure a fairly accurate height achieved for each rocket. This activity rounded out the week touching on all categories of STEAM. Science through how rockets work and how our air powered ones would be propelled. The technology of rockets themselves along with the technology aspect of the launcher being used. Engineering was clearly seen as student designed and constructed their rockets for launch. The blueprints, as well as the rockets themselves, certainly touched on art. Math was abundant through the calculations of the vertical height the rockets were launched.

Throughout the entire experience the children were actively engaged in STEAM activities. Students enjoyed the experience and would regularly attend future opportunities in the area. These sessions also helped provide university education student volunteers opportunities to interact with real children through practice rather than simply reading and discussing it as theory. The weeks appeared to be a very positive experience for all involved. Even university student volunteers have continued to be involved in a wide variety of STEAM related activities since these activities. This was especially important and encouraging, as these were the first formal STEAM activities experienced by a majority of the participants and volunteers. As for the children, following these activities sustained one hour STEAM classes were offered once a week over the following year for students wishing to explore further. These sessions were well and regularly attended. STEAM has gotten much more recognition and interest in our area not only among families but also a number of local schools

kindergarten, primary, and higher education (including a fine arts university) have also sought STEAM professional development for their teachers and pre-service teachers.

## References

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