A modular guitar for teaching musical acoustics

In order to keep students activated in a course on musical acoustics, they were asked to build a modular guitar, designed to be updated throughout the course. In the first stage, dedicated to the physics of strings, a guitar was made out of three strings attached to a long piece of wood. The students measured the effect of the place of plucking on the mode of the vibrations of the strings. The second stage was dedicated to the acoustic resonances. Using a laser cutter, the students built a wooden box that was coupled to their guitar using straps. New acoustical measurements were made to study the effect of the shape of the resonator on the spectrum of the sound. In the third stage, as the different tuning systems were learned, the students built a fingerboard with the appropriated positions of the frets. In the last stage, the students have implemented some digital effects and tested them on their guitar using a piezo-electrical pickup. As nothing was glued, the students were able to easily change each part of the guitar (resonator, sound hole, fret positions, microphone, …) in order to experience their direct effect and their interactions.

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