

Training Gadget with force visualization system as a learning tool of periodontal treatment



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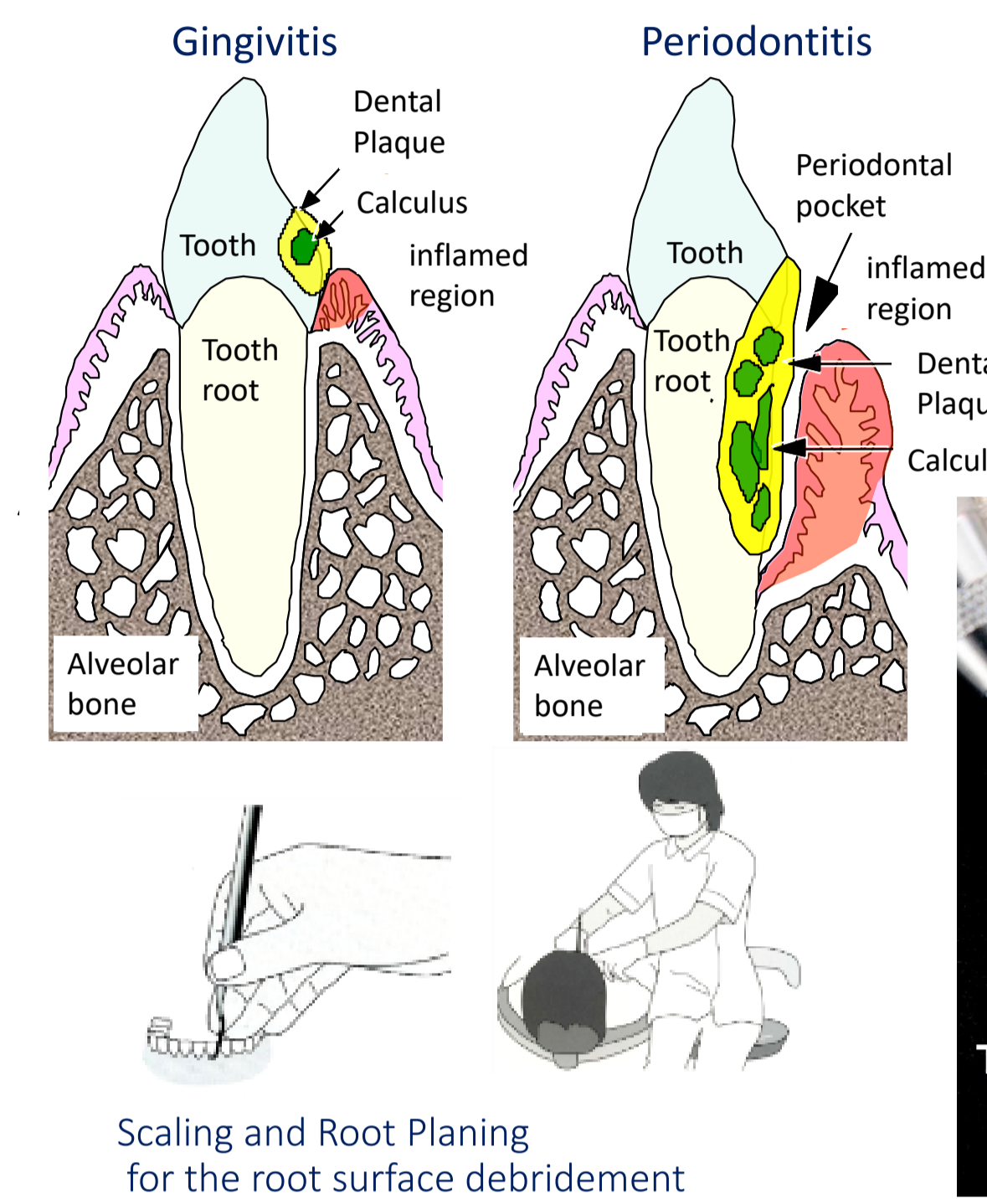
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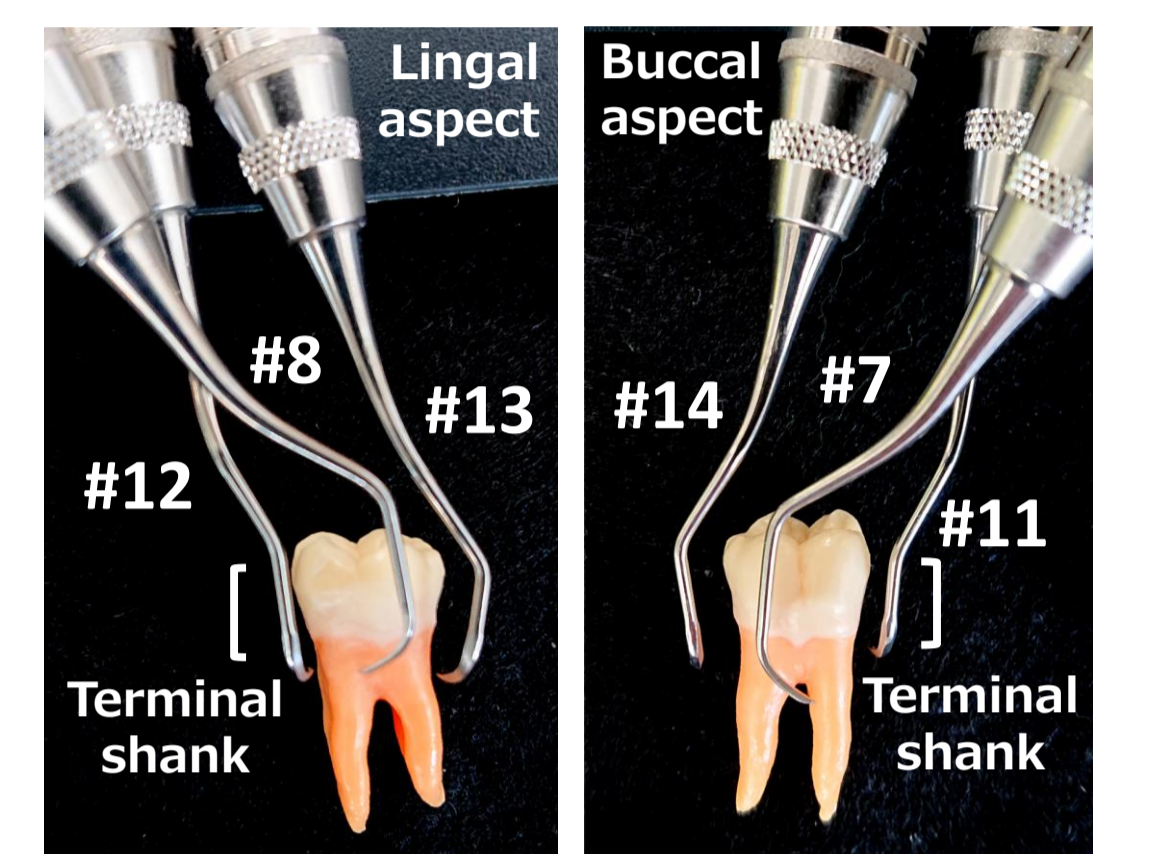
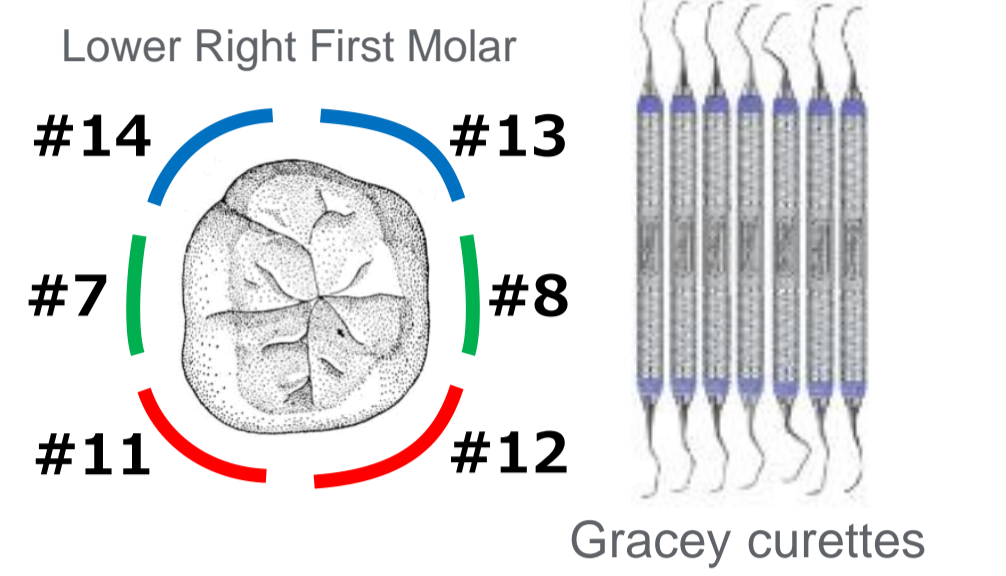
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Introduction: Sophisticated and delicate hand instrumentation technique is essential for the treatments of dental caries and periodontal diseases. Students need adequate and intensive training to get a grasp of sensitive manipulation. Complete removal of subgingival calculus and microbial deposits from root surfaces is one of the essential skills for successful periodontal treatments. To learn these clinical skills of scaling and root planing (SRP) efficiently and effectively, we developed the Training Gadget as a learning tool of periodontal treatment with the force-visibility of hand instrumentation. In this report, we describe the developed Training Gadget, and discuss the application in the training of professional skills.

Periodontal Treatment



Selection of Gracey curettes



Hands-on practice systems for basic periodontal treatment recommended by the Japan Society of Periodontology

https://www.perio.jp/news/basic_practice.shtml

Learning materials



Artificial calculus on the model tooth



Training stick of calculus removal

<http://www.nissin-dental.jp/products/educationalmodels/srp/images/sheet.pdf>

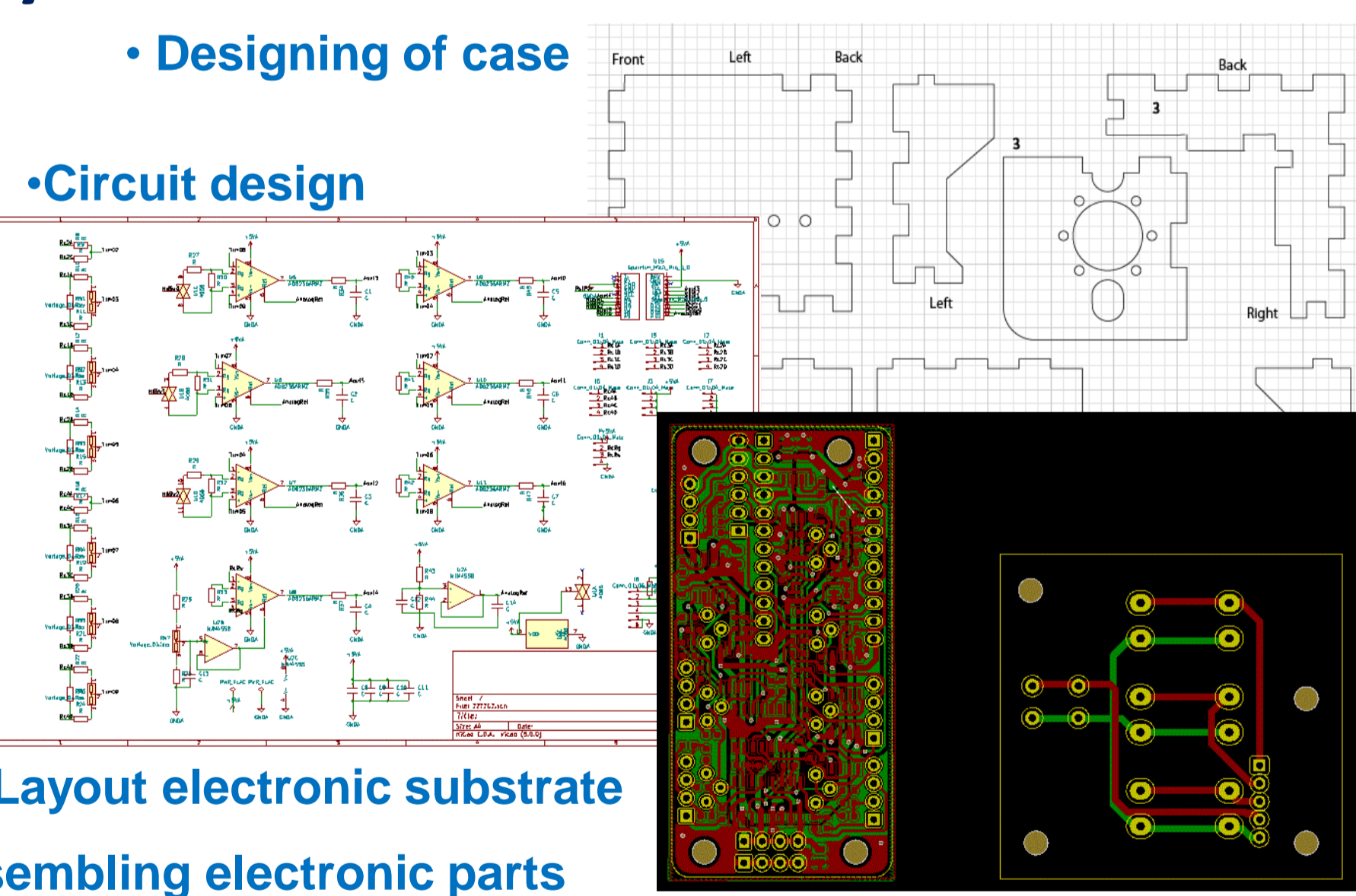
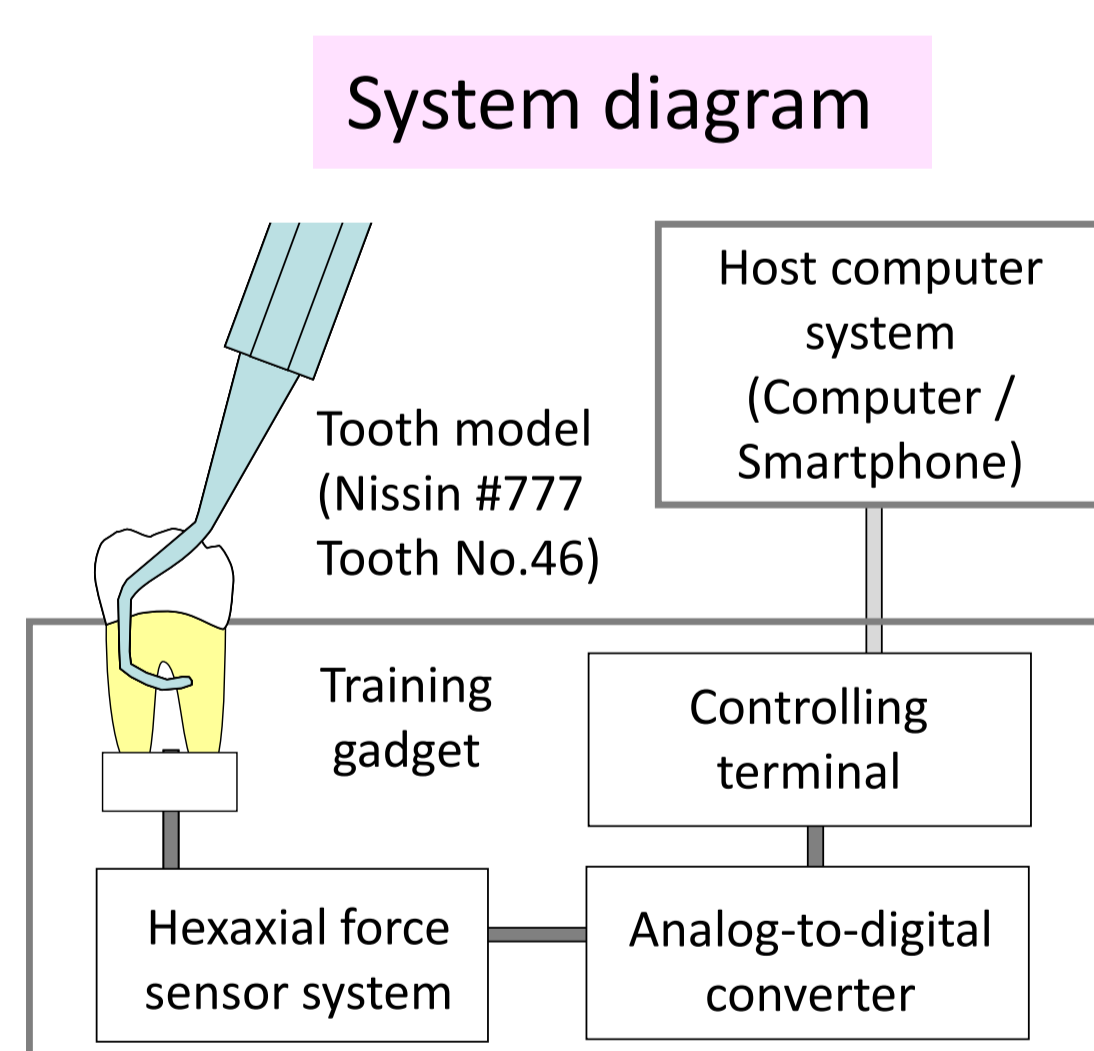
Yes, we can learn how to move, BUT HOW ABOUT FORCE ?



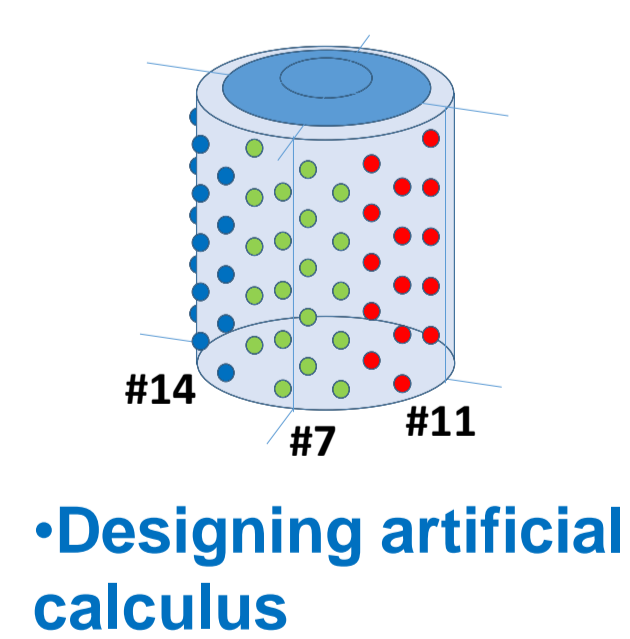
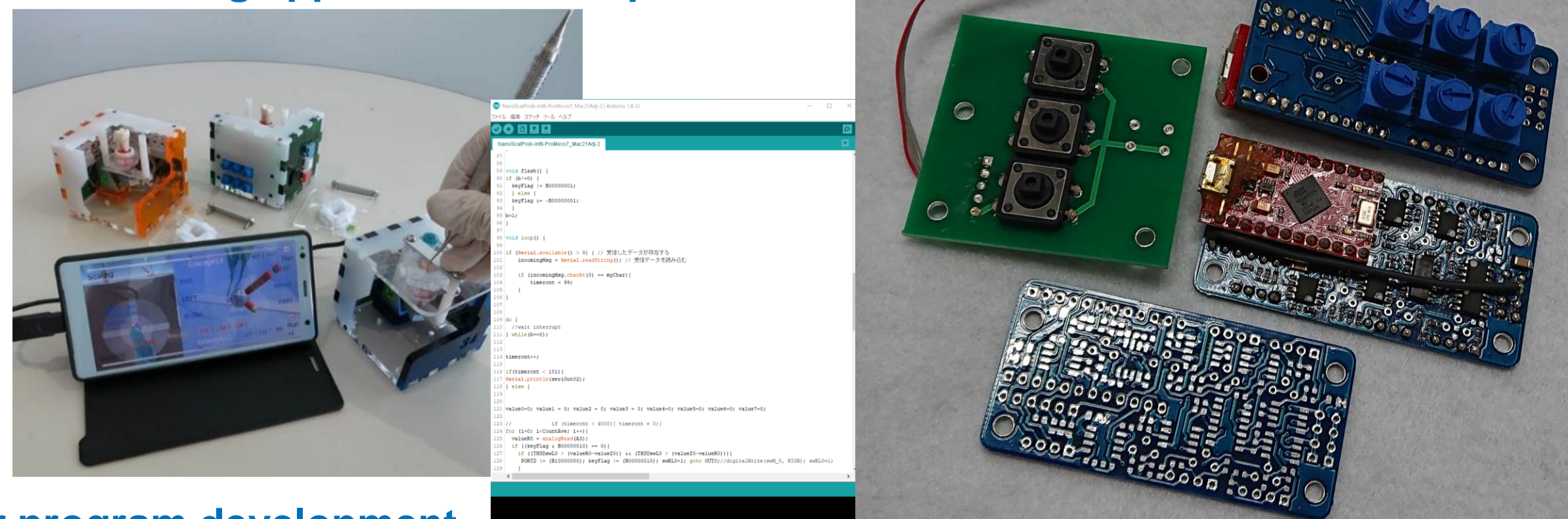
FORCE VISUALIZATION SYSTEM should be EMBEDDED.

Materials and Methods: For developing this education system, we tried to visualize the invisible force against the target tooth applied by trainee's manipulation. The model tooth (A2ARA-777, Nissin Co.Ltd) which connected to the 3D force sensors, was embedded into the top of Training Gadget. Output signals were processed with instrumentation amplifier and analog-digital converter, then the force data were transmitted to host computer or smartphone through USB connection. For display the force of manipulation, we used a game engine, Unity 2018.3.0f2 provided by Unity Technologies. Three dental students, who just started the clinical course of SRP, performed the SRP manipulation by using this Training Gadget, and described the impression of this learning system.

Developed Training Gadget with force-visibility of hand instrumentation



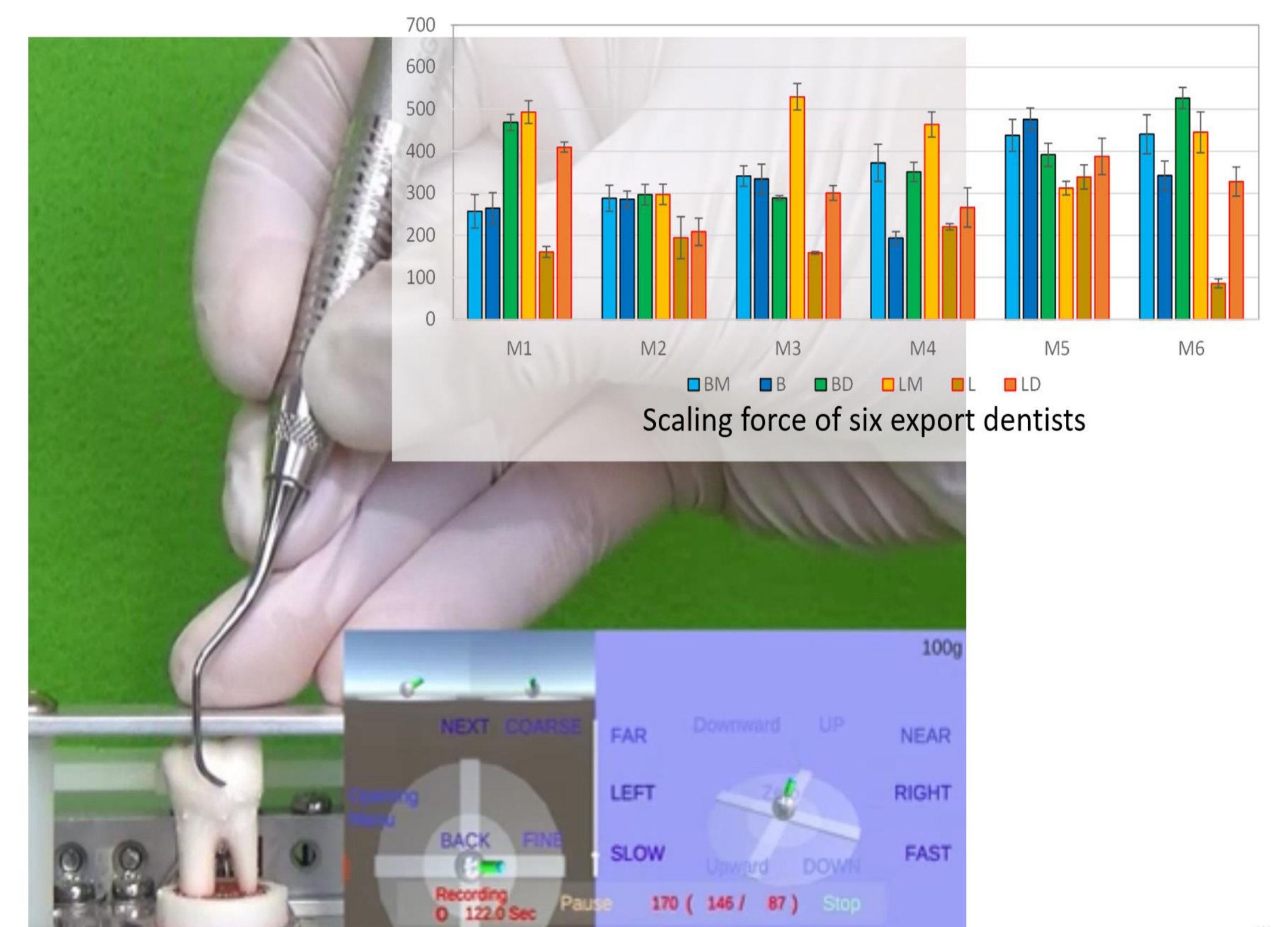
Force-viewing application development



Designing artificial calculus

Controller program development

Developed force visualization system



Results and Discussion: Three male students used this Training Gadget. All of them agreed with the usefulness for beginners to understand the tactile sense of SRP, and mentioned the possibility of enlarging the learning opportunity as a remote education system. Using the visually appealing technologies of virtual reality, we are able to observe the force applied to the model tooth from various directions in real time operation. In the age of the coronavirus, this Training Gadget may provide one of the solutions in the remote education system for manipulation skills in dentistry.

