

## 9/26/18 Brainstorming and Design Matrices

Criteria (weight)	Design 1 Hunter	Design 2 Joe	Design 3 Lucas	Design 4 Yanbo	Design 5 Jonah
Ease of Use (25)	5/5 (25)	5/5 (25)	5/5 (25)	5/5 (25)	5/5 (25)
Safety (25)	5/5 (25)	3/5 (15)	3/5 (15)	5/5 (25)	4/5 (20)
Viewing Angle (15)	4/5 (12)	4/5 (12)	5/5 (15)	4/5 (12)	4/5 (12)
Size (15)	3/5 (9)	4/5 (12)	3/5 (9)	4/5 (12)	5/5 (15)
Cost (10)	2/5 (4)	5/5 (10)	4/5 (8)	4/5 (8)	5/5 (10)
Sterilizability (10)	5/5 (10)	3/5 (6)	3/5 (6)	3/5 (6)	4/5 (8)
Total (100)	85	80	78	88	90

We chose design 5 due to its increased ease of use, very small camera apparatus, and low cost.

### Criteria Justification:

Ease of Use was given a weight of 25 because this impacts both the success of dental procedures attempted with our future product as well as demand for the product (if it isn't easy to use, fewer people will want it). The impact on procedure success is largely determined by how much the proposed design would necessitate deviations from the dentist's existing procedures. Since none of these designs negatively significantly change the shape of the drill, they do not impact the dentist's procedure and all were given scores of 5/5.

Safety was given a weight of 25 because this device is meant to improve the safety for the patient during the procedure by providing the dentist better visibility while preparing for a crown. The device must not have rough edges or have protrusions that could snag or scrape the patient. Designs 1 and 4 were given a score of 5 because their designs are enclosed in the drill housing, so there are not exposed corners, edges, or electronics. Design 2 was awarded a 3 because the mounting clips on the outside of the housing, which could cause peripheral damage to the soft tissue of the patient. Design 3 had the camera mounted from straps attached to the drill housing, and these could become loose and fall off and cause unnecessary damage. Design 4 was given a 4 because its mounting was low profile and had soft edges, but it was not as secure as being mounted inside the housing. Design 5 was given a 4 because the camera attachment is snapped on to the dental handpiece head, which could possibly fall off during the operation if not properly connected.

Viewing Angle was given a weight of 15 because the camera must focus on the place where the drill works to allow user to directly view the position of the crown replacement surgery clearly. Designs 1, 2, 4, and 5 were given scores of 4/5 because they all had the camera

pointing approximately parallel to the side of the head, which will provide a good view of the space directly in front of the drill. Design 3 was given a score of 5/5 because it intentionally angled the camera to look directly at the tip of the drill, granting a more focused view of what the dentist is cutting at a given moment.

Size was weighted 15 because the size of the scope attachment must be small enough to not impede the crown removal procedure. Ideally, the attachment and camera will fit in the operation site without applying much pressure to surrounding teeth or the cheek. Designs 1 and 3 were given scores of 3/5 because they entailed bulkier mechanisms of positioning the camera than any other designs. Designs 2 and 4 were given scores of 4/5 due to their slimmer designs that had the camera and wire both secured against the side of the drill head directly. Design 5 was the most highly rated at 5/5 because of its even slimmer clip-on camera holster.

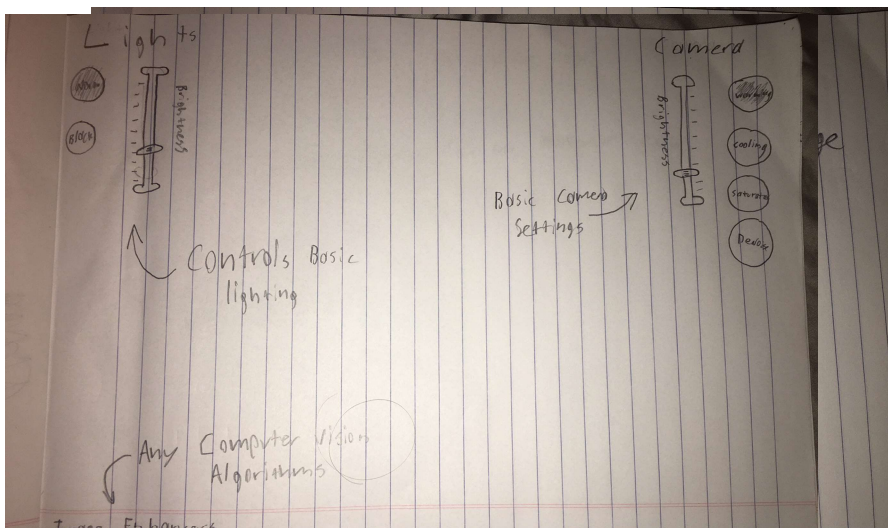
In order to ensure that the design is economically feasible, the cost of the prototype should be minimized. Anything more than \$100 is considered expensive, but the client provided us with a large budget of \$1000, so this category was only given a 10 for importance. Design 1 was given a 2 for this category because it involves a touch screen display and designing a new housing to fit the drill and the electronics. Designs 2 and 5 were given perfect scores because they were very minimal of just a 3D printed housing to hold the camera clipped on the outside of the drill. Design 3 involved an adjustable camera mount that would have more complicated components compared to a clip in mount, so it was given a 4. Finally, Design 4 involved leading the wire into the drill case, which would require redesigning the drill housing and would become costly, so it was only given a 4 for this category.

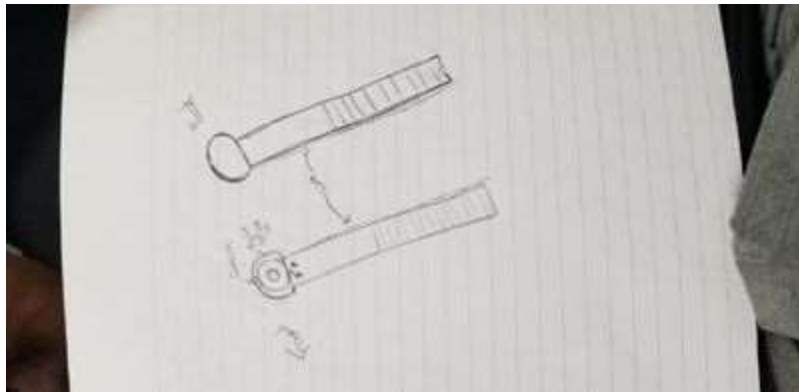
The camera and attachment unit should be sterilizable to ensure protection of each patient and of the dental professional from possible pathogen transfer, earning a weight of 10. If the camera and attachment unit can be removed from the handpiece, this could allow it to be sterilized separately and using more appropriate methods than those that might be applied to the handpiece. Design 1 was given a 5 because the entire handpiece is placed in a robust module with the camera, allowing it to be sterilized as a single apparatus. Design 2 did not offer much protection for the camera itself though the sterilization process, earning it a 3. Design 3 suffered the same problem, as did design 4. Design 5 has a detachable camera apparatus, allowing it to be sterilized separately from the dental drill. This earned it a rating of 4.

### Design 1 - Hunter

\*the design for the housing/mounting of the camera and the lights for the drill

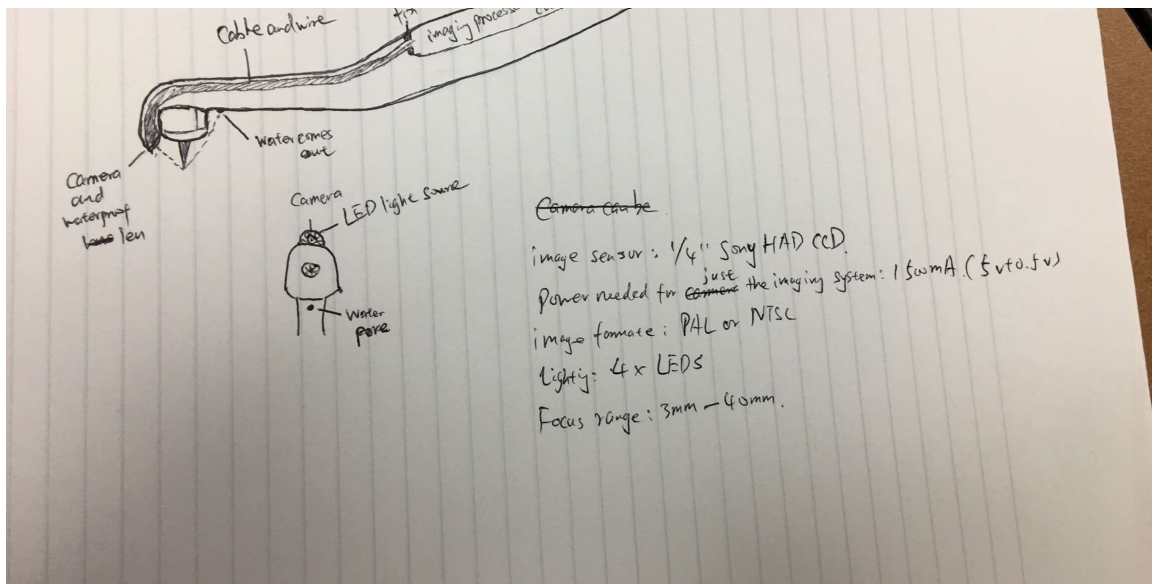
\*This is the design for the user interface on the screen which can adjust camera and light settings





Design 3 - Lucas

Design 4- Yanbo



Design 5 - Jonah

