

# **VisionIdentify GPT: How well can it detect biological images?**

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**Running Title:** AI for Image Detection

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## **ABSTRACT**

**Introduction:** The application of advanced neural networks has equipped the Generative Pre-trained Transformer (GPT-4) with the ability to ‘see,’ ‘hear,’ and ‘speak.’ This new GPT, also known as the ‘VisionIdentify GPT,’ can now detect patterns and extract meaningful information from visual data. Our study explored how well VisionIdentify GPT can recognize biological images and help develop image-based teaching materials for dental and medical education. **Project description:** Hand-drawn biological illustrations and histological sections were used as inputs for VisionIdentify GPT. The new GPT showed high accuracy in identifying biological illustrations. However, it was inaccurate in detecting histological sections and was unable to annotate images accurately. **Discussion:** VisionIdentify GPT has high potential but is yet to develop fully. **Conclusions:** Specialized training with discipline-specific data can enhance the mastery of this new vision-powered GPT in a specific area and become a helpful tool for specialized tasks.

**Keywords:** artificial intelligence; computer-assisted image interpretation; dental education; education; machine learning; teaching materials

**CDHA Research Agenda category:** capacity building of the profession

## **PRACTICAL IMPLICATIONS OF THIS RESEARCH**

- VisionIdentify GPT has extreme potential but is still in its infancy.
- Training with discipline-specific data can enhance the usability of VisionIdentify GPT.

## INTRODUCTION

The recent advancement of Artificial Intelligence (AI), particularly the Large Language Models (LLMs), has revolutionized many aspects of our lives by reshaping human-machine interactions.<sup>1</sup> AI is gradually integrating into diverse industries, transforming the way we work, study, communicate, interact, diagnose, and partake in entertainment.<sup>1,2</sup> The term LLMs, although well-known, is challenging to define, encompassing all its evolving features.

A hierarchy exists between AI, neural networks, and LLMs (Figure 1). AI refers to computer systems that can perform tasks that traditionally involve human intelligence.<sup>3</sup> Machine learning is a subgroup of AI that enables machines to “learn and adapt without following explicit instructions by using algorithms and statistical models to analyze and draw inferences from patterns in data.”<sup>3</sup> Neural Networks are a subcategory of machine learning that uses a computer system modeled by following the structure and function of human nervous system.<sup>3</sup> A deep neural network is a type of neural network in which multiple processing layers are used to extract higher-level features from data.<sup>3</sup> Along this line, the latest development is LLMs, where deep learning models are applied to understand and generate human-like text. Thirunavukarasu et al.<sup>4</sup> describe LLMs as “a type of AI model using deep neural networks to learn the relationships between words in natural language, using large datasets of text to train.”

Until 2023, LLMs were only able to read and comprehend text-based data. However, the LLMs can now ‘see,’ ‘hear,’ and ‘speak.’<sup>5,6</sup> The application of advanced neural networks has enabled the Generative Pre-trained Transformer (GPT-4), called the ‘VisionIdentify GPT,’ to detect patterns and extract meaningful information from visual data.<sup>6,7</sup> This addition to LLMs has opened

new potential for medical image analysis and diagnosis.<sup>8,9</sup> However, the impact of this new technology on education is still an open question.

One primary concern for educators is the possible exploitation of LLMs by students in academic dishonesty,<sup>10</sup> which becomes even more prominent with the new VisionIdentify GPT. Previous versions of LLMs were also found to provide incorrect and irrelevant references, rendering this technology less reliable as a teaching tool.<sup>11,12</sup> We conducted a study to explore the ability of VisionIdentify GPT to recognize biological images and develop image-based teaching materials for dental and medical education. Our specific research questions are:

1. How precise is VisionIdentify GPT in recognizing individual biological illustrations?
2. How efficient is VisionIdentify GPT in interpreting images depicting cellular processes?
3. How accurate is VisionIdentify GPT in recognizing histological sections?
4. How useful can VisionIdentify GPT be in creating or modifying images for teaching?

## **PROJECT DESCRIPTION**

VisionIdentify GPT is a recent advancement of ChatGPT, accessed from <https://chatgpt.com/g/g-I0Hr6S6hN-visionidentify-gpt-image-recognition-ai>. Several illustrations, commonly used in dental and medical education, were generated using a graphics editor, Procreate<sup>13</sup> on an iPad, and multiple textbooks<sup>14,15</sup> as references. Histological images were sourced from digital scans of tissue sections traditionally employed to teach oral histology. Screenshots were captured from portions of the digital slides and were saved in JPEG format. Images were numbered (e.g., Image1, Image2) before being used as inputs to VisionIdentify GPT:

Image Recognition AI.<sup>7</sup> GPT-generated responses were evaluated independently by content experts (authors, NS, AC), and percent accuracy was calculated by comparing the number of correct outputs to the total number of inputs.

The input files included:

- Three biological illustrations
  - a longitudinal section of a tooth
  - a neuron
  - microscopic structure of a compact bone
- Illustrations of two cellular processes
  - theta replication, a common type of replication in circular DNA (without labels)
  - tooth development (with minimal labels)
- Three histological sections
  - cross-section of the crown of a human tooth
  - keratinized epithelium of the hard palate
  - specialized epithelium of the tongue

## **RESULTS**

### **Precision of VisionIdentify GPT in recognizing biological illustrations**

VisionIdentify GPT showed 67% accuracy in identifying hand-drawn biological illustrations. Two out of three illustrations were identified correctly. In response to a simple prompt (Can you tell me what this is), VisionIdentify GPT responded with a detailed, correct description of all visible structures of a neuron and the microscopic structure of a compact bone. The GPT misidentified the

longitudinal section of a tooth as the cross-section. However, the description of other internal structures of the tooth was accurate (Figure 2).

### **Efficiency of VisionIdentify GPT in interpreting cellular processes**

VisionIdentify GPT was incorrect in detecting unlabeled illustration of theta replication. It accurately recognized minimally labeled images of the embryonic tooth development (Figure 3). However, the same tooth development image was misinterpreted by VisionIdentify GPT when labels were removed (results not shown).

### **Accuracy of VisionIdentify GPT in recognizing histological sections**

VisionIdentify GPT was inaccurate in detecting the cross-section of the tooth crown, misinterpreting it as the cross-sectional view of a fungus. However, it could accurately identify all underlying structures when it was mentioned as a cross-section of a human tooth in a follow-up prompt (Figure 4A). When GPT was prompted with “What type of epithelium is shown here?” it accurately identified and described the keratinized epithelium of the hard palate (Figure 4B).

### **Usefulness of VisionIdentify GPT as a tool to label images**

VisionIdentify GPT accurately described the structures visible in the tongue section, however, it showed 0% accuracy in adding labels to a given image (Figure 5A). When asked, VisionIdentify GPT incorrectly placed several annotations on a given image. Asking the GPT to improve the labeling resulted in only minimal improvements. VisionIdentify GPT was presented with an image

of a healthy tooth, prompting it to show how things will change in a diseased condition. The marks and lines added by the GPT were incomprehensible. Requests to further improve the annotations were refused by the GPT (Figure 5B).

## DISCUSSION

Our pilot study aimed to explore the efficiency of the VisionIdentify GPT in identifying and editing biological images. This GPT efficiently identified and described simple illustrations of biological structures, accurately describing the colours, shapes, and locations. For example, while explaining the illustration of the neuron, VisionIdentify GPT mentioned:

**“Cell Body (Soma):** The central part of the neuron that contains the nucleus (shown as a dark spot).

**Myelin Sheath Segments:** The orange, bead-like structures around the axon that insulate and speed up electrical transmission.” (Figure-2)

Our results indicate that this new GPT model can recognize patterns and text within an image and can use both information to create the output. When presented with an unlabelled image of theta replication or tooth development, VisionIdentify GPT could not identify the images accurately. However, adding minimal labels helped the GPT extract meaningful information and accurately identify the cellular process (Figure 3).

VisionIdentify GPT failed to differentiate between closely related histological structures. The cross-section of the tooth crown was misinterpreted as the cross-sectional view of a fungus. The tongue was misinterpreted as a histological section of the small intestine (data not shown). However, this misinterpretation resulted in closely related structures with similar visual patterns responding to a broad prompt. Successful identification of a tissue section under a microscope requires integrating multiple pieces of information, including the angle of the section, staining method, magnification, and orientation. Because this vision-powered GPT improved its results with follow-up hints, it can potentially enhance efficiency in detecting specialized images with discipline-specific training.

Similar to previous LLMs,<sup>16,17</sup> VisionIdentify GPT also provided inconsistent information in response to the same prompt. Although this feature makes GPT more ‘human-like,’ this inconsistency can lead to major issues, limiting its utility for educational and diagnostic purposes. For example, in response to the same prompt, ‘Can you tell me what this is?’ the cross-section of the crown of a human tooth was once identified as the cross-section of a fungus, the other time as the cross-section of a horn or hoof.

VisionIdentify GPT has not yet been developed enough to generate accurate images to use as teaching tools for biomedical sciences. We asked the GPT to perform simple tasks like labeling or modifying an existing image. VisionIdentify GPT could successfully describe the structures, but placed the labels higher than where they should be on the image. This GPT also failed to modify a given image (Figure-5). Instructors often struggle to find the biological images showing the

current angle and details needed to meet the teaching needs. Unfortunately, text-to-image generators are ineffective for creating anatomically correct biological images.<sup>18,19</sup> If VisionIdentify GPT can be further refined to annotate or modify a given image accurately, it can greatly benefit educators in preparing teaching materials.

We acknowledge several limitations of our study. VisionIdentify GPT was tested on a small image set without comparative baselines or scoring metrics, limiting the generalizability of our findings. Future research should compare image detection performance across multiple GPT models, including newer versions like GPT-o3 with enhanced image interpretation, deep thinking, and reasoning capabilities.<sup>20</sup>

## **CONCLUSION**

VisionIdentify GPT is a great new technology that is still in its infancy. Reports exploring the potential of LLMs in general medicine, medical imaging, diagnosis, and health professional education are largely growing, highlighting the need for further improvement of this model.<sup>14, 21</sup> Specialized training with discipline-specific data can enhance the mastery of LLMs like VisionIdentify GPT in a specific area and become a helpful tool for specialized tasks.

## **CONFLICTS OF INTEREST**

The authors declare that they have no competing interests.

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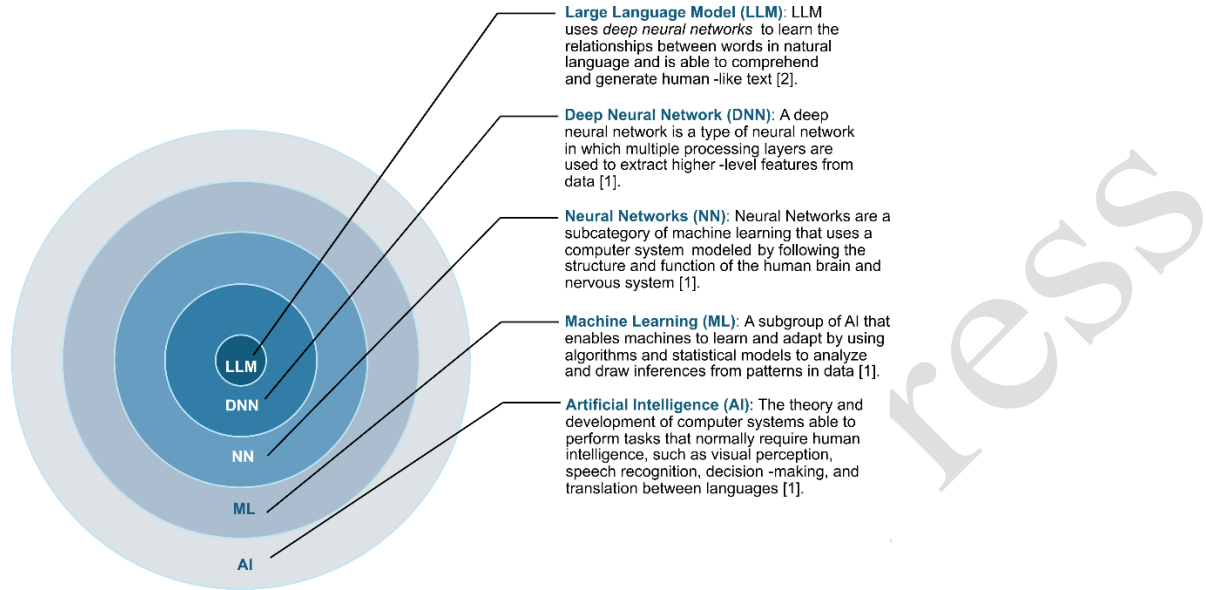
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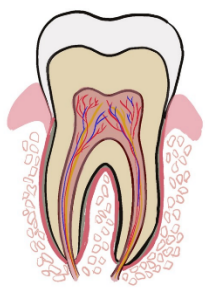
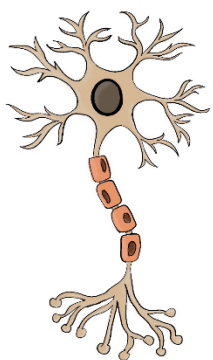
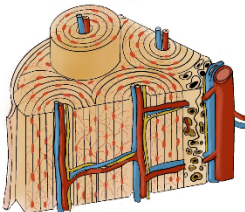
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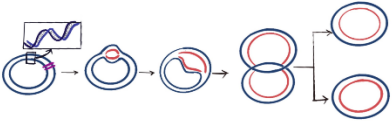
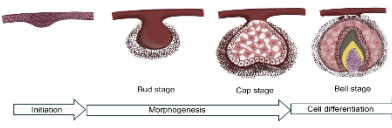
**Figure 1** The hierarchy between artificial intelligence (AI), machine learning (ML), neural networks (NN), and large language models (LLMs).




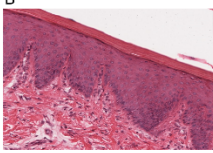
**Figure 2** Effectiveness of VisionIdentify GPT in recognizing individual biological illustrations. Three biological illustrations, including a longitudinal section of a tooth (A), a neuron (B) and the microscopic structure of a compact bone (C), were used as input in VisionIdentify GPT. Inaccurate responses from VisionIdentify GPT are highlighted.

Images used as input	Prompts	Responses from VisionIdentify GPT: Image Recognition AI
<p>A</p> 	<p>What is shown here?</p>	<p>This diagram represents the <b>cross-section of a tooth</b>, illustrating its internal anatomy and surrounding structures. Key components visible in the image include:</p> <ol style="list-style-type: none"> <li><b>Enamel</b> (outermost white layer): The hard, protective outer covering of the tooth.</li> <li><b>Dentin</b> (yellowish layer beneath enamel): The dense, calcified tissue forming the bulk of the tooth.</li> <li><b>Pulp Chamber</b> (center with blood vessels and nerves): The innermost part containing connective tissue, blood vessels, and nerves.</li> <li><b>Root Canal</b>: The extension of the pulp chamber into the roots of the tooth.</li> <li><b>Cementum</b> (covering the root): A calcified layer anchoring the tooth to the periodontal ligament.</li> <li><b>Periodontal Ligament</b>: Connective tissue holding the tooth in its bony socket.</li> <li><b>Alveolar Bone</b>: The surrounding bone structure supporting the tooth.</li> </ol> <p>This diagram is a classic representation of tooth anatomy, useful in studying dental structure and function.</p>
<p>B</p> 	<p>Can you tell me what this is?</p>	<p>This is an illustration of a <b>neuron</b>, which is a specialized cell found in the nervous system responsible for transmitting information throughout the body. Here are the main parts visible in your drawing:</p> <ol style="list-style-type: none"> <li><b>Dendrites</b>: The branching structures at the top of the neuron, which receive signals from other neurons.</li> <li><b>Cell Body (Soma)</b>: The central part of the neuron that contains the nucleus (shown as a dark spot).</li> <li><b>Axon</b>: The elongated structure extending from the cell body, responsible for transmitting signals away from the soma.</li> <li><b>Myelin Sheath Segments</b>: The orange, bead-like structures around the axon that insulate and speed up electrical transmission.</li> <li><b>Axon Terminals</b>: The branching structures at the end, which connect to other neurons or muscle fibers to transmit signals.</li> </ol> <p>This illustration simplifies how neurons communicate and form the basis of neural networks in the brain and nervous system.</p>
<p>C</p> 	<p>Can you tell me what this is?</p>	<p>This image illustrates the microscopic structure of <b>compact bone</b> (also known as cortical bone), focusing on the osteon or Haversian system. It depicts:</p> <ol style="list-style-type: none"> <li><b>Osteons</b>: The cylindrical units of compact bone, arranged concentrically around a central canal.</li> <li><b>Haversian Canal</b>: The central space within each osteon, housing blood vessels and nerves.</li> <li><b>Lamellae</b>: Concentric layers of calcified matrix around the Haversian canal.</li> <li><b>Lacunae</b>: Small spaces housing osteocytes (bone cells).</li> <li><b>Canaliculi</b>: Tiny channels connecting lacunae, allowing nutrients and signals to pass between osteocytes.</li> <li><b>Volkmann's Canals</b>: Horizontal or oblique channels that connect adjacent osteons and the periosteum, aiding in blood and nerve supply.</li> </ol> <p>This diagram is a classic representation of the histological structure of compact bone tissue, essential for strength and nutrient delivery in skeletal systems.</p>

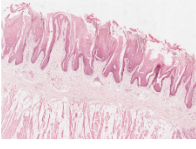
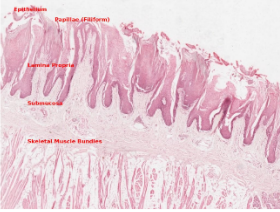


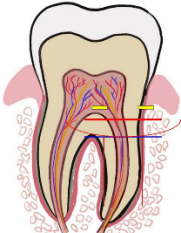
**Figure 3** Efficiency of VisionIdentify GPT in interpreting cellular processes. VisionIdentify GPT was asked to interpret two hand-drawn cellular processes: an unlabeled illustration of theta replication (A) and a minimally labeled illustration of tooth development (B). Inaccurate responses from VisionIdentify GPT are highlighted.

Images and prompts used as input	Responses from VisionIdentify GPT: Image Recognition AI
<p data-bbox="198 241 214 262"><b>A</b></p>  <p data-bbox="324 504 470 525">What is shown here?</p>	<p data-bbox="633 226 1023 294">This diagram illustrates the process of <b>binary fission</b>, a common method of reproduction in prokaryotic organisms such as bacteria. Here's a step-by-step explanation of the stages shown:</p> <ol data-bbox="633 294 1023 703" style="list-style-type: none"> <li><b>1. DNA Replication (First Circle with Zoomed-In DNA)</b> <ul style="list-style-type: none"> <li>The bacterial DNA (a circular chromosome) is duplicated.</li> <li>The DNA unwinds, and a copy of the genetic material is created.</li> </ul> </li> <li><b>2. DNA Attachment and Elongation (Second Circle)</b> <ul style="list-style-type: none"> <li>The replicated DNA molecules attach to the cell membrane at opposite ends of the cell.</li> <li>The cell elongates, creating more space between the two sets of DNA.</li> </ul> </li> <li><b>3. Formation of Septum (Third Circle)</b> <ul style="list-style-type: none"> <li>The cell membrane begins to pinch inward at the middle of the elongated cell.</li> <li>A <b>septum</b> (division wall) forms, separating the two DNA molecules.</li> </ul> </li> <li><b>4. Cytokinesis (Fourth Circle)</b> <ul style="list-style-type: none"> <li>The septum continues to grow, eventually meeting and completely dividing the cell into two parts.</li> <li>The two daughter cells separate.</li> </ul> </li> <li><b>5. Completion (Final Two Circles)</b> <ul style="list-style-type: none"> <li>Two genetically identical daughter cells are formed, each with a complete copy of the original DNA.</li> <li>These cells are ready to grow and reproduce again.</li> </ul> </li> </ol> <p data-bbox="633 703 1023 766">This process ensures that each daughter cell has the same genetic material as the parent, enabling rapid population growth in bacteria.</p>
<p data-bbox="198 787 214 808"><b>B</b></p>  <p data-bbox="324 1081 470 1102">What is shown here?</p>	<p data-bbox="633 787 1023 871">This image illustrates the stages of <b>tooth development</b> during embryogenesis. It is a highly organized process that progresses through several stages, leading to the formation of a functional tooth. Below is an explanation of each stage shown:</p> <ol data-bbox="633 871 1023 1323" style="list-style-type: none"> <li><b>1. Initiation:</b> <ul style="list-style-type: none"> <li>This represents the early stages where a thickening of the oral epithelium occurs to form a dental lamina. It is the precursor to tooth development.</li> </ul> </li> <li><b>2. Bud Stage:</b> <ul style="list-style-type: none"> <li>The dental lamina forms a bud-like projection into the underlying mesenchyme. This stage marks the early establishment of the tooth germ, where epithelial cells begin to proliferate.</li> </ul> </li> <li><b>3. Cap Stage:</b> <ul style="list-style-type: none"> <li>The epithelial bud folds and forms a cap-like structure over the condensed mesenchyme. This stage defines the enamel organ, dental papilla, and dental follicle. Each of these structures contributes to the enamel, dentin, and surrounding tooth-supporting structures, respectively.</li> </ul> </li> <li><b>4. Bell Stage:</b> <ul style="list-style-type: none"> <li>The enamel organ takes on a bell shape, and the different cell layers begin to differentiate. This stage leads to the development of ameloblasts (which form enamel) and odontoblasts (which form dentin). The structure of the tooth crown is established.</li> </ul> </li> <li><b>5. Cell Differentiation:</b> <ul style="list-style-type: none"> <li>Specialized cells (ameloblasts and odontoblasts) start to produce enamel and dentin, finalizing the tooth's mineralized tissues. The root will form later after crown development is complete.</li> </ul> </li> </ol> <p data-bbox="633 1323 1023 1375">This schematic provides an overview of the <b>morphogenesis</b> (structural changes) and <b>cell differentiation</b> involved in tooth formation.</p>

**Figure 4** Accuracy of VisionIdentify GPT in recognizing histological sections. Two histological sections, including a cross-section of the crown of a human tooth (A) and a keratinized epithelium of hard palate (B) were used as inputs in VisionIdentify GPT. Inaccurate responses from VisionIdentify GPT are highlighted.

Images and prompts used as inputs	Responses from VisionIdentify GPT: Image Recognition AI	Correct answer (Original source)
<p>A</p>  <p>Can you tell me what this is?</p>	<p>This appears to be a cross-sectional view of a fungus, specifically a piece of <i>Ganoderma lucidum</i>, commonly known as Reishi mushroom or Lingzhi. The thick brown outer edge is characteristic of its woody exterior, and the light interior is its spore-bearing tissue. <i>Ganoderma lucidum</i> is highly valued in traditional medicine for its purported health benefits, including immune system support and antioxidant properties. It grows on hardwoods and is typically harvested and processed into powders, teas, or extracts for medicinal use.</p>	<p>Cross-section of the crown of a human tooth</p>
<p>(Follow up prompt)</p> <p>This is the cross-section of a human tooth. Can you describe the different parts of this image?</p>	<p>Thank you for clarifying that this is a cross-section of a human tooth. Here's a detailed description of the visible parts based on the cross-section:</p> <ol style="list-style-type: none"> <li><b>Enamel</b> <ul style="list-style-type: none"> <li>• Location: The outermost layer along the curved edge at the top (appearing dark brown or darker in this image).</li> <li>• Function: The enamel is the hardest tissue in the human body and protects the tooth from wear and decay. It covers the crown of the tooth (the visible part in the mouth).</li> </ul> </li> <li><b>Dentin</b> <ul style="list-style-type: none"> <li>• Location: The lighter-colored, slightly porous layer beneath the enamel and cementum.</li> <li>• Function: Dentin makes up the bulk of the tooth. It is less hard than enamel but still provides structural support and protection for the inner pulp chamber. Dentin is sensitive to temperature and pressure because it contains microscopic tubules leading to the pulp.</li> </ul> </li> <li><b>Pulp Chamber</b> <ul style="list-style-type: none"> <li>• Location: The central region with open, irregular cavities in the image (two prominent ones can be seen here).</li> <li>• Function: This soft tissue contains blood vessels, nerves, and connective tissue, supplying nutrients and sensory information to the tooth. The pulp extends into the root canals.</li> </ul> </li> <li><b>Cementum</b> <ul style="list-style-type: none"> <li>• Location: Found along the outer layer of the root portion of the tooth, just below the gum line (not visible on this cross-section if this is only the crown).</li> <li>• Function: Cementum anchors the tooth within the jaw by attaching it to the periodontal ligament.</li> </ul> </li> <li><b>Periodontal Ligament (Not Visible Here)</b> <ul style="list-style-type: none"> <li>• This ligament attaches the cementum of the root to the alveolar bone, stabilizing the tooth within the jaw.</li> </ul> </li> <li><b>Root Canals</b> <ul style="list-style-type: none"> <li>• Location: Extending down from the pulp chamber (not fully visible here as this appears to be a crown section).</li> <li>• Function: Channels that house blood vessels and nerves extending through the root of the tooth into the surrounding bone.</li> </ul> </li> </ol> <p>This specific image showcases the crown section, where the enamel, dentin, and pulp are most prominent.</p>	
<p>B</p>  <p>What type of epithelium is shown here?</p>	<p>This is a histological image showing <b>stratified squamous epithelium</b> under a microscope. Based on the visible features:</p> <ul style="list-style-type: none"> <li>• <b>Stratification:</b> Multiple layers of cells are visible, with flattened cells (squamous) towards the surface.</li> <li>• <b>Basal layer:</b> Cuboidal or columnar cells in the lower layers indicate a regenerative basal layer.</li> <li>• <b>Keratinization (possible):</b> If the outermost cells appear devoid of nuclei, it could suggest keratinized epithelium, as seen in areas like skin. If nuclei are present on the surface, it is non-keratinized, typical of areas like the esophagus.</li> </ul> <p>This tissue likely represents a section of keratinized or non-keratinized stratified squamous epithelium, depending on the specific location in the body.</p>	<p>Keratinized epithelium of anterior palate (hard palate).</p>

**Figure 5** Usefulness of VisionIdentify GPT in generating images to use as a teaching tool. VisionIdentify GPT was asked to label a histological section of the tongue (A). Presented with a healthy tooth structure, the GPT was asked to show how the structure would change in a disease state (periodontal disease) (B).

Images and prompts used as input	Responses from VisionIdentify GPT: Image Recognition AI
<p><b>A</b></p>  <p>This is a histological section of the human tongue. What structures can you see here?</p>	<p>This is a histological section of the human tongue stained using hematoxylin and eosin (H&amp;E), highlighting several key features of its tissue architecture. The following structures can be observed:</p> <ol style="list-style-type: none"> <li><b>Epithelium:</b> <ul style="list-style-type: none"> <li>The topmost layer consists of stratified squamous epithelium. In the human tongue, this can be keratinized or non-keratinized depending on the specific area (e.g., keratinized on the dorsal surface).</li> <li>The surface projections correspond to the papillae, which contribute to the texture of the tongue.</li> </ul> </li> <li><b>Papillae:</b> <ul style="list-style-type: none"> <li>Filiform Papillae: Thin, finger-like projections that are highly keratinized. These are primarily involved in mechanical functions.</li> <li>Fungiform Papillae (potentially visible): Larger and more rounded papillae interspersed among filiform papillae, containing taste buds.</li> </ul> </li> <li><b>Connective Tissue Layer (Lamina Propria):</b> <ul style="list-style-type: none"> <li>Beneath the epithelium, you can see the lamina propria, which is part of the mucosa. It supports the epithelium and contains blood vessels and immune cells.</li> </ul> </li> <li><b>Submucosa:</b> <ul style="list-style-type: none"> <li>A deeper layer composed of connective tissue with larger blood vessels, nerves, and glands.</li> </ul> </li> <li><b>Underlying Muscle Layers:</b> <ul style="list-style-type: none"> <li>The section may show bundles of skeletal muscle fibers running in various directions (intrinsic muscles of the tongue), characteristic of the tongue's versatility in movement.</li> </ul> </li> </ol>
<p>(Follow up prompt) Can you label this image for me?</p>	<p>I have labeled the histological image for you! You can download the labeled version using the link below:</p>  <p>Labeled Histology Tongue Image</p>
<p>(Follow up prompt) Can you put the labels in proper places on the image?</p>	<p>I have repositioned the labels to align more accurately with the structures in the image. You can download the updated labeled image using the link below:</p>  <p>Adjusted Labeled Histology Tongue Image</p>
<p><b>B</b></p>  <p>This is a healthy tooth. Can you show in this image how things will look if the tooth has periodontal disease?</p>	<p>I have simulated the changes in a tooth affected by periodontal disease, showing receding gums, bone loss, exposed roots, inflammation, and plaque buildup. You can download the updated image here:</p>  <p>Diseased Tooth Image</p>
<p>Can you modify my image to better represent bone loss, exposed roots, inflammation, and plaque buildup?</p>	<p>It seems like I can't do more advanced data analysis right now. Please try again later. If you'd like, I can guide you through editing this image manually or assist with any other request. Let me know how you'd like to proceed!</p>