



InstaHisto: Utilizing Instagram as a Medium for Disseminating Visual Educational Resources

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Abstract

Background Applying active recall during studying vexes medical students. The integration of social media into medical education is rapidly expanding; however, there is minimal use of Instagram in medical education. Histology is a visually dominant subject and pairs well with Instagram. We sought to create a standardized process for medical educators to establish Instagram as a study tool for histology.

Methods An Instagram account accessible to MS1s was created. Histology images in the course syllabus along with questions and explanations for each image were organized and posted to Instagram in a question and answer format. Instagram analytics on student engagement were gathered along with student survey responses.

Results Seventy-four percent (141/190) of the class followed the account. Images had an average of 442 total views. Images had an average of 3.5 views per user (VPUs), ranging from 2.6 to 4.3 VPUs, suggesting that students are viewing images multiple times. Ninety-eight percent of survey responders found the account easy to use. Ninety-five percent said studying the account increased their confidence when answering histology questions on exams, and 75% said the account led to decreased stress when studying histology.

Discussion Instagram is a platform that the majority of our medical students are already using daily. There was strong evidence of student engagement via Instagram analytics. Once a database of images with questions and answers is established, content can readily be posted to Instagram for students to study. Once established, this process can be applied to other visual content, such as anatomy, radiology, pathology, and microbiology.

Keywords Instagram · Histology · Social media · Medical student education

Introduction

The use of social media as a learning tool in medical education is a rapidly expanding field. Social media continues to evoke discussion regarding possible uses, although the research regarding its effectiveness is minimal [1]. Currently, the majority of publications emphasize Twitter and Facebook as learning and collaboration tools [2]. Instagram is a popular form of social media, with over 1 billion users worldwide. Instagram connects users through the sharing of visual media in the form of images, short videos, and brief captions. In contrast to its

popularity, Instagram has yet to gain traction as a learning tool in medical education. As a visually dominant form of social media, Instagram is an ideal learning tool for visual subjects, such as radiology, anatomy, and pathology.

Histology is another visually dominant subject that presents challenges for educators and students alike. As histology curricula move away from using microscopes in the laboratory to virtual microscopes, educators will need to adapt how they deliver material. Histology is a challenging subject for students to master, given the extensive need for exposure and repetition to high-quality images.

Given the extensive amount and complex nature of information that medical students are required to learn, it is imperative that educators design curricula to promote efficient learning with long-term retention. Spaced retrieval has been demonstrated to be a superior form of learning with multiple studies demonstrating decreased forgetting and increased memorization [3]. Educators must adapt, changing from

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traditional teaching styles to incorporating spaced retrieval techniques into their curricula. The utilization of social media is one way to do so. Instagram enables users to retrieve information actively by prompting with images and associated questions.

A review of the literature indicated there are existing Instagram accounts designed as learning tools in undergraduate and graduate medical education, particularly radiology; however, there is a lack of data regarding student engagement in addition to student perceptions of using Instagram [4]. The process of building an educational Instagram account is lacking in the literature. We sought to describe our protocol for establishing an educational Instagram account. We will also discuss how to track student engagement through data analytics provided through Instagram free of charge, while sharing the data we gathered from our histology Instagram account.

(@UNCSOMHisto is our public account that is accessible to all via the Instagram app.)

Design

At the University of North Carolina School of Medicine, the preclinical or basic science curriculum spans the first three semesters, with each semester containing 4 or 5 instructional blocks of approximately 4 weeks each in length. Histology and cell biology are distributed throughout these various blocks as appropriate (Table 1). Histology sessions are

typically located earlier in a block, with pathophysiology and pathology sessions taught later.

An Instagram account was created by downloading the free app onto a smartphone. To have class-specific accounts, we used the following naming convention for the account: @UNCSOMHisto2023. We created a specific email to establish the Instagram account, and this email was used as a contact in our profile for users to send feedback. In order to have access to data analytics provided by Instagram, called Insights, the account must be set up as a professional account.

The account must also be *public* rather than *private* to gain access to Insights. By being public, any Instagram user can find the account. To ensure only first-year medical students from UNC were following the account, students were required to contact our team via email or direct message within Instagram to confirm their standing in the class. The account was monitored frequently to ensure only UNC MS1s were following the account. Refer to Table 2 for a step-by-step approach for establishing a functional account.

A database of histology images was established in accordance with the histology curriculum. Questions and answers with explanations were created for each image. We sought to create straightforward first- and second-order questions, with the goal of forming a foundation of knowledge rather than simulating lengthy, complex board-style test questions. First-order questions focused on identification of structures, such as “what is the structure between the arrows?” or “what type of connective tissue is shown?” Second-order questions

Table 1 Histology content embedded in curricular blocks

Semester	Block	Histology sessions
1	Principles of medicine	Cell biology Epithelial tissue Connective tissue
1	Immunologic	Blood and hematopoiesis Lymphoid tissue
1	Hematologic	None
1	Cardiovascular	Cardiac/smooth muscle and blood vessels
2	Respiratory	Respiratory
2	Renal	Urinary
2	Gastrointestinal	Upper GI Lower GI
2	Integumentary and musculoskeletal	Skin Bone and bone formation Muscular system
3	Human behavior in health and disease	None
3	Neurologic	Nervous system
3	Endocrine	Endocrine
3	Reproductive	Male reproductive Female reproductive
3	Multi-organ system	None

Table 2 Protocol for establishing educational Instagram account and image database

Setting up account	
1	Create a new Instagram account using Instagram app on smartphone or tablet
2	Update information including profile picture, contact information, bio (account description)
3	Switch to professional account to view Insights Settings → Account → Switch to Professional Account → Business → Education → Public
Preparing account content	
4	Establish database of educational images
5	Select images that contain important teaching points amenable to question and answer format
6	Create question, answer, and explanation for each image
7	Type questions with answer options into Word document for easy cut-and-paste access
Formatting histology images	
8	Insert desired image to PowerPoint
9	Format image to ensure height equals width (at least 320 × 320 pixels) <i>Make sure to deselect “Lock aspect ratio”</i>
10	Save newly formatted image
Formatting answers with explanations	
11	On a new slide, type correct answer and explanation into text box
12	Format text box to ensure height equals width
13	Using Snipping Tool (PC) or Grab (Mac), create an image of the text box
14	Save image of text box alongside the corresponding histology image
Uploading account content to feed	
15	Determine when images/questions should be posted to correlate with curriculum
16	Transfer prepared histology images, answer images, and Word document with questions to device <i>Note: Posts must be uploaded from a smartphone or tablet. Images and files may be transferred using email or Bluetooth (e.g., Airdrop) or through a file transferring app (e.g., Dropbox)</i>
17	Open Instagram on device and select [+] in bottom center to create a new post
18	Select layered square button on the right to allow for selection of multiple images within a single post
19	Click histology image first (1) followed by corresponding answer image (2), and hit next twice
20	Copy and paste question and answer choices into “caption”
21	Share post for followers to view <i>It is also possible to save posts for later by hitting back twice and selecting “Save Draft.” This allows the user to save time by preparing many posts at once and then return to share them one at a time in a spaced fashion</i>
22	Use Insights to monitor student engagement with posted material

challenged students to identify structures and then take the next step to determine function, such as “what is the purpose of this epithelium?” or “what hormones do these cells produce?”

In order to maintain the quality of the histology images and to create esthetically sound posts, it was important to follow Instagram’s specific requirements for uploading images. Images must be at least 320 × 320 pixels in order to maintain proper resolution on Instagram. In order to post multiple images under the same post (necessary to create the side-by-side image and answer formatting), images must be perfectly square. Table 2 also details the process required for editing the images and explanations, as we found that creating square images and square text boxes containing answers/explanation is done most easily in PowerPoint.

Histology images were uploaded alongside the explanation image, as Instagram allows for multiple images to be uploaded

as one post. The question with answer choices were entered as text in the caption. The user can then swipe to the left to reveal the answer and explanation image, as seen in Fig. 1.

Posts were uploaded to complement the histology lectures and small groups, progressing from foundational concepts to more advanced topics. After a histology small-group session, the corresponding images were uploaded with questions and answers over the next few days. We recommend posting at least 4–6 h apart, as not to overwhelm the students with multiple posts at once. We also attempted to post during high usage times, which can be determined based on Profile Insights. Profile Insights, which can be accessed from the profile page, reveal the average times during the day when followers are on Instagram as well as the days of the week when followers are most active.

Students were able to view posts as they scrolled the main Instagram feed on their smartphone, tablet, or laptop. While

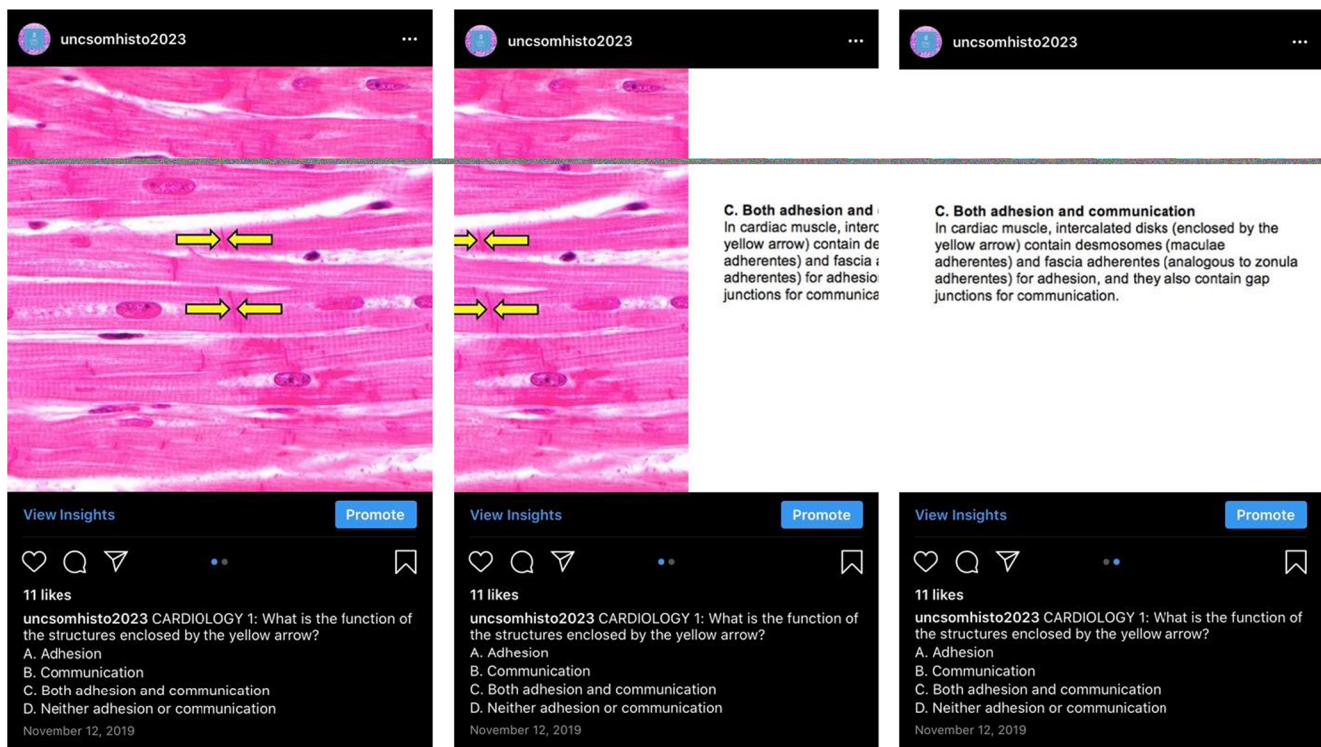


Fig. 1 Question and answer design provides opportunity for active retrieval. The screen captures demonstrate how students are able to engage with posts. Students first see the histology image and then read a related question in the caption with possible answer choices listed. Students have time to answer the question mentally, similar to the

scrolling through the main feed, students could choose whether they wished to engage with the material or not. If so, they looked at the image and the question, mentally answered, and then swiped left to reveal the answer and explanation. If students did not wish to engage, they simply scrolled past the image and continued using Instagram for personal enjoyment. Students could also go directly to the @UNCSOMHisto2023 profile page where all posts exist in a virtual library, as demonstrated in Fig. 2. This created a study resource that students could easily access, especially when setting aside dedicated time to study histology and for quick review prior to examinations.

Methods

Instagram Analytics

Students' usage of the account was measured using Instagram's data analytics, called Insights. Insights tracks several metrics of follower engagement with posted images. We selected two terms (reach and impressions) to extract for each post. *Reach* refers to the number of unique users who viewed a given post since its debut. *Impressions* refers to the number of total views on a given post, accounting for the fact that some

structure of a flashcard, before swiping from right to left to reveal the correct answer with its corresponding explanation. Additionally, these screen captures show how an educator might access student engagement data ("View Insights") from individual posts

users may view an image more than once. We felt these two variables were objective measures of student engagement versus subjective measures such as likes or comments.

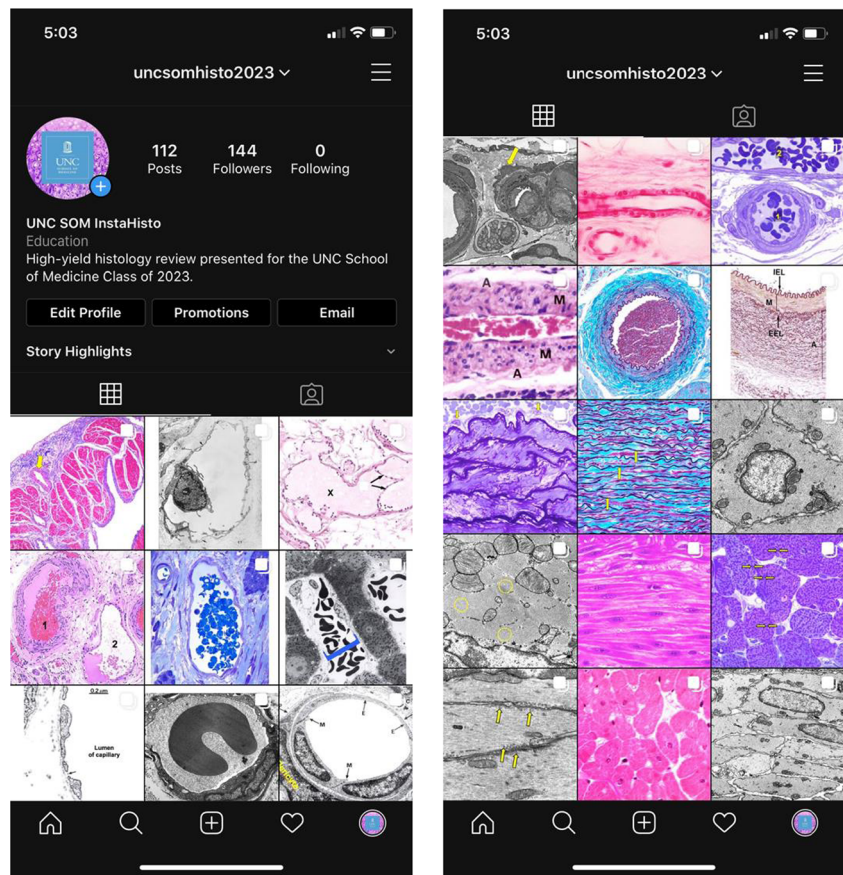
Images were posted over a 1-month trial period between Aug 9, 2019, and Sep 9, 2019. After the conclusion of the trial period, reach and impressions values were extracted for each post by selecting "View Insights" or by accessing insights from the main menu on the profile page. An additional data point, termed views per user (VPUs), was created to represent the ratio of impressions to reach. Reach, impressions, and VPUs were averaged across all posts made during the trial period. Standard deviations were also calculated to provide context as to the range in each of these values across posts.

Student Perception

In addition to Instagram analytics, an evaluation was disseminated to the first-year class with questions regarding personal Instagram usage and use of @UNCSOMHisto2023, as well as perceptions of @UNCSOMHisto2023 with regard to ease of use, impact on studying and test taking, and overall satisfaction. The evaluation was developed locally and carefully reviewed by two authors (KG, GLBD).

We hypothesized that using a social media platform to disseminate study material might increase students' access

Fig. 2 Virtual library created by profile page. Students can access all previous posts from the account homepage, creating a virtual library for students to access at their convenience (pictured left, with scrolled down screen capture on the right). This allows for quick access and increased repetition of challenging images and concepts, particularly leading up to examinations



of such materials during free time or down time (e.g., public transit). The evaluation was designed to test this hypothesis, as well as measure the subjective perceptions of the account by the student body. We also sought to discover if students felt this study tool increased their confidence and performance on exams, particularly on histology material. Questions to this effect were included in the evaluation tool, as student test data were not extracted during this short trial period.

The evaluation was linked on the @UNC SOMHisto2023 account and sent out by email to the first-year class listserv.

Results

A total of 79 posts were made during the 1-month trial period, which spanned five histology sessions and four graded examinations. Out of the 190 students in the first-year class, 92 students were following the account on the day of the first post and 141 students were following the account at the end of the pilot period.

Analytics from Instagram showed an average reach of 125.9 (SD 5.16) users and an average of 441.7 (SD 57.44) impressions per post. This led to an average of 3.5 (SD 0.4) VPU on posts across the pilot period.

A total of 68 students responded to the disseminated evaluation. Four evaluations were excluded because respondents either did not have an Instagram account or did not follow @UNC SOMHisto2023. This left a total of 64 evaluations for analysis. Based on these evaluations, 87% previously had an Instagram account and 9% reported creating a free account specifically to follow @UNC SOMHisto2023.

Questions related to utilization indicated that the majority of students accessed the account from a smartphone (88%), though a minority indicated using a computer (6%) or a combination of devices (5%) including tablets. As shown in Fig. 3 a, students indicated using the account in their free time (78%), on public transit (58%), and during dedicated study time (59%). The majority of students (67%) used the account in more than one of these domains.

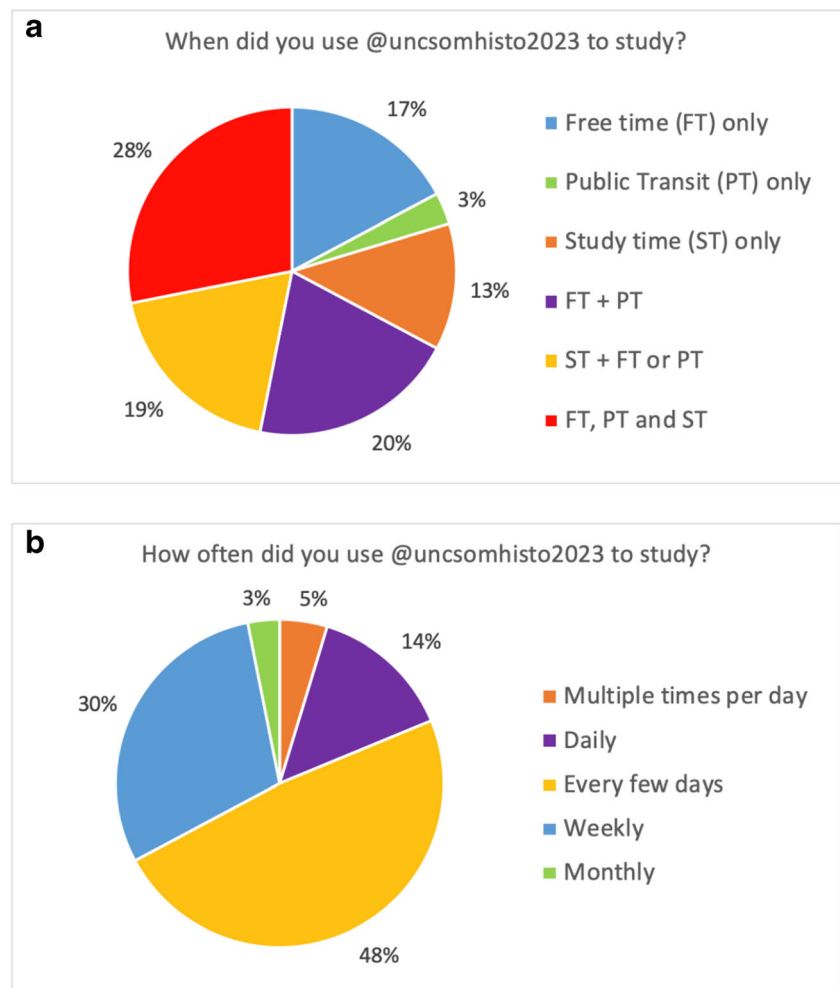
Students used the account to study with variable frequency throughout the week. Just under half of students reported using the account every few days, 28.8% used it weekly, and 13.6% used it daily (Fig. 3b). The majority of students (73%) reported viewing individual posts at least twice. Over three quarters of students accessed the account from both their main feed (among posts from other followers) and from the account's profile page (from searching the account).

Of survey respondents using the account, 98% indicated that the account was easy to use. All respondents said they

Fig. 3 a Location of @uncsomhisto2023 use per student survey responses.

Students reported accessing the account during a combination of free time, time on public transit and dedicated study time.

b Data from the evaluation tool disseminated to members of the first year class (n=64) indicated that a majority of students used @uncsomhisto2023 to study every few days or weekly. 19% indicated they used the account to study at least once a day



would recommend following the account to their classmates. Nearly all users (98%) said they used the account to study in preparation for tests and quizzes and felt Instagram helped them on their UNC-developed examinations; 77% of students responding thought the account was helpful for histology content on National Board of Medical Examiners final examinations. The majority (95%) felt studying with the account increased their confidence on histology material, and 66% felt they spent less time answering histology questions compared to other subjects.

Discussion

Although numerous medical education Instagram accounts exist, this is the first publication that specifically details how to establish a high-quality medical education account. In addition, this is the first study to publish specific data regarding student engagement with a medical education Instagram account. These data provide a clear, objective measurement of

active student engagement, as they confirm students are viewing images multiple times.

Repetition is an important component of learning, and our design provided students the opportunity for spaced repetition with a challenging subject. Our data demonstrated students were using Instagram as a repetition tool as each individual viewed each image on average 3.5 times.

Insights can be used for curriculum quality improvement. By calculating VPUs for each post, educators can determine if images and questions are too simple or too complex. For example, if the majority of posts receive 4 VPUs, with one outlier having 7 VPUs, this may suggest that this post was too challenging or that the knowledge required to answer that question was not adequately conveyed during the initial lecture or small group. The educator could address this by creating a new post with a similar image to emphasize the important teaching points that students must learn. Conversely, if a post garners only 1.5 VPU, the educator may decide to omit that post from next year's class and introduce a more challenging image or question. Educators can easily track VPUs to guide them as they make adjustments to their curriculum and their posts.

Another way to use Insights effectively is to monitor the utilization times to influence the times when posts are uploaded. In general, our students used Instagram during the weekdays at similar times with some variation on weekend days. If peak usage times fall in the mornings before lectures or later in the evenings, the best times to post can be identified to ensure your followers will be more likely to see the images at these times. Conversely, users may not begin to use Instagram until later in the mornings on weekends, so delaying posting on Saturdays and Sundays would benefit the students. This activity data is also easily accessible, making it simple for the educator to monitor this information and post accordingly.

The responses from our evaluation confirmed our previous hypotheses and supported the student usage data. We believed students would gravitate to a platform such as Instagram, given its ubiquitous nature in this digital age. The large majority of medical students have Instagram, use it daily, and were happy to follow an educational account. One of the proposed downsides of using social media as a study tool is the concern that students will not want educational material in a space designed for relaxation and personal enjoyment. However, Instagram is set up in such a manner that students can always choose to engage or not engage, depending on their desire to study. Users can simply scroll past our posts if they wish to do so, with minimal invasion into their personal space. Also, the content on Instagram is available in the course learning management system, but as a static document. We hypothesized students would not feel that @UNC SOMHisto2023 impacted their personal enjoyment of Instagram, and this was supported by our evaluation that reported 100% of students would recommend the account to a friend.

The hallmark of social media is the ability to access material on any portable device, such as smartphones or tablets. Using social media as a study tool enables students to use time that would otherwise be wasted, such as time spent on public transit, to study high-quality, focused information. Our evaluations confirmed this idea, with a high percentage of students indicating they used our account during free time (78%) and public transit (58%).

As medical knowledge expands, so do the number of resources available to students. This creates an issue for students as they try to determine which resources they should use without becoming overwhelmed. Potentially more problematic, educators face the challenge of having their students utilizing resources containing unvetted information. Utilizing Instagram as we have outlined addresses both issues. Students are already using Instagram, so they do not need to add another resource to their study arsenal. Additionally, this new resource is controlled entirely by the educator, as they choose the images, create the questions and answers, and align the posts with their curriculum. Students are then given a new avenue for studying without adding to their resource burden, while educators can confidently support this resource as reputable.

Our design created focused questions with explanations that required students to actively engage with the material. One of the critiques of using Instagram as a learning tool is that it promotes only passive learning. This is a reasonable argument with many educational accounts that have the question and answer all embedded in a singular image. However, our account clearly demonstrated how Instagram can be used as an active learning tool. Our design mirrored flashcards, as students viewed the image and accompanying question and processed the answer before it was revealed by swiping left. By posting the answer and explanation as a second image within the post, students were given the opportunity to engage the information actively in a manner promoting more effective learning.

One major drawback of using an educational Instagram account is the amount of groundwork and oversight it requires. Creating an account is simple; however, creating a database of images and questions takes time and organization. In addition, formatting the images and explanations is time-consuming. Once the database is established and the images are formatted for the first cohort, posting for subsequent classes requires minimal work. Furthermore, managing the account and uploading posts are basic tasks that were managed by medical students on the project. Instagram is incredibly user-friendly and does not require a technologically savvy team to manage. Now that we have established our database of images, we plan to continue to involve medical students to manage the posting, reducing the burden on faculty. Once the foundation is laid, the amount of work required to maintain a high-quality account is minimal.

Other future directions include exploring other features that Instagram provides, including “Stories.” Within the Stories feature, users can create quizzes with multiple-choice answers that provide instant feedback. Students would then be able to test their knowledge and address any deficiencies provided in this different format. Educators can access Insights from these Stories as well, providing more data to guide their posts and curriculum.

Histology is just one of many domains in medical education that encompasses visually dominant material. The concept of an educational Instagram account can be translated to create accounts for radiology, pathology, anatomy, microbiology, and dermatology. Although accounts for some of these subject areas already exist, many are case-based with detailed explanations all imbedded within one image. Other accounts utilize the comments section for student involvement. However, these subjects would benefit from our design as those topics could be presented with a focused question-and-answer format in order to create active learning with spaced repetition.

Importantly, the data regarding the impact of social media on test performance are lacking. Our evaluation confirmed that our students spent less time on histology questions and exhibited improved confidence when answering histology questions; however, we have no data to correlate

@UNCSOMHisto2023 with improved test scores. Concrete evidence that Instagram improves test scores would bolster educators' desire to support such accounts and encourage students to utilize this resource to its full potential. We hope to examine the effectiveness of @UNCSOMHisto2023 in relation to test performance in the future.

Conclusion

Instagram is a widely popular, user-friendly form of social media that is ideal for disseminating visually dominant subjects, such as histology. We created an Instagram account and uploaded histology images with questions and explanations that complemented our current histology curriculum. Students expressed high satisfaction with the account as a learning tool, and the data extracted from Instagram's Insights provided objective confirmation that students were engaging with the material. Although there are medical educational Instagram accounts in existence, our design encourages active learning with spaced repetition that students can access during time that would be otherwise not spent on studying. We believe our straightforward design as outlined above is reproducible for other educators and will benefit student and educator alike.

Authors' Contributions Mr. Essig, Ms. Watts, Dr. Beck Dallaghan, and Dr. Gilliland contributed to the conception of this study, the analysis of

the data, the writing and editing of the manuscript, and final approval of the submission.

Data Availability Data is available upon request to the corresponding author.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflicts of interest.

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