Requirements Specification (Version 1)

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Project:

C & I Doctoral Tracking Tool

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What's Up Doc

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Accepted as the baseline requirements for the project.

Client: _____ **Project Lead:** _____

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1.0 Introduction

Learning from one's mistakes is a key aspect of development and that is especially true in the world of education. This development process of learning from one's mistakes is achieved through a simple feedback loop. As early as second or third grade, we are taught a trivial three step process: take an examination, turn said exam in, and receive a grade. This early exposure to feedback is important because it introduces educational criticism into the student's life and begins to prepare them for the hardships that they may face in higher education.

According to data reported in 2021, 16.6 million undergraduate students and 3.1 million graduate students attended universities across the United States. [1] Many of those 16.6 million undergraduate students likely used software called Learning Management Systems (LMS) to help facilitate course delivery and act as grade feedback tools. Learning Management Systems, such as Blackboard Learn or Canvas, are traditionally able to accommodate most undergraduate classes due to the innate pass/fail system, or A-F grade system, that these classes generally adhere to. Assignments and examinations from class to class are quite rigid in that they pertain to lectures or chapters of an assigned reading, thus they may be outlined and planned before a semester even begins. This rigidity is absent in graduate school as graduate students perform activities that are less quantifiable, such as shadowing mentors and researching. Therefore, it is considerably harder to deliver the graduate program using a LMS.

The Coordinator of the Curriculum and Instruction (C&I) doctoral program at Northern Arizona University (NAU), Gretchen McAllister, Ph.D., and Administrative Services Assistant, Michele Benedict, have both experienced the shortcomings of Blackboard Learn firsthand. As a result, neither is able to track the milestones of their graduate students using an LMS. In order to attain candidacy in the C&I Ph.D program, graduate students must complete a minimum of 60 graduate-level course units, professional development requirements, comprehensive written and oral exams, a qualifying research paper, approval and assignment of a dissertation committee, and submission of an approved dissertation prospectus. These many milestones must be tracked one way or another.

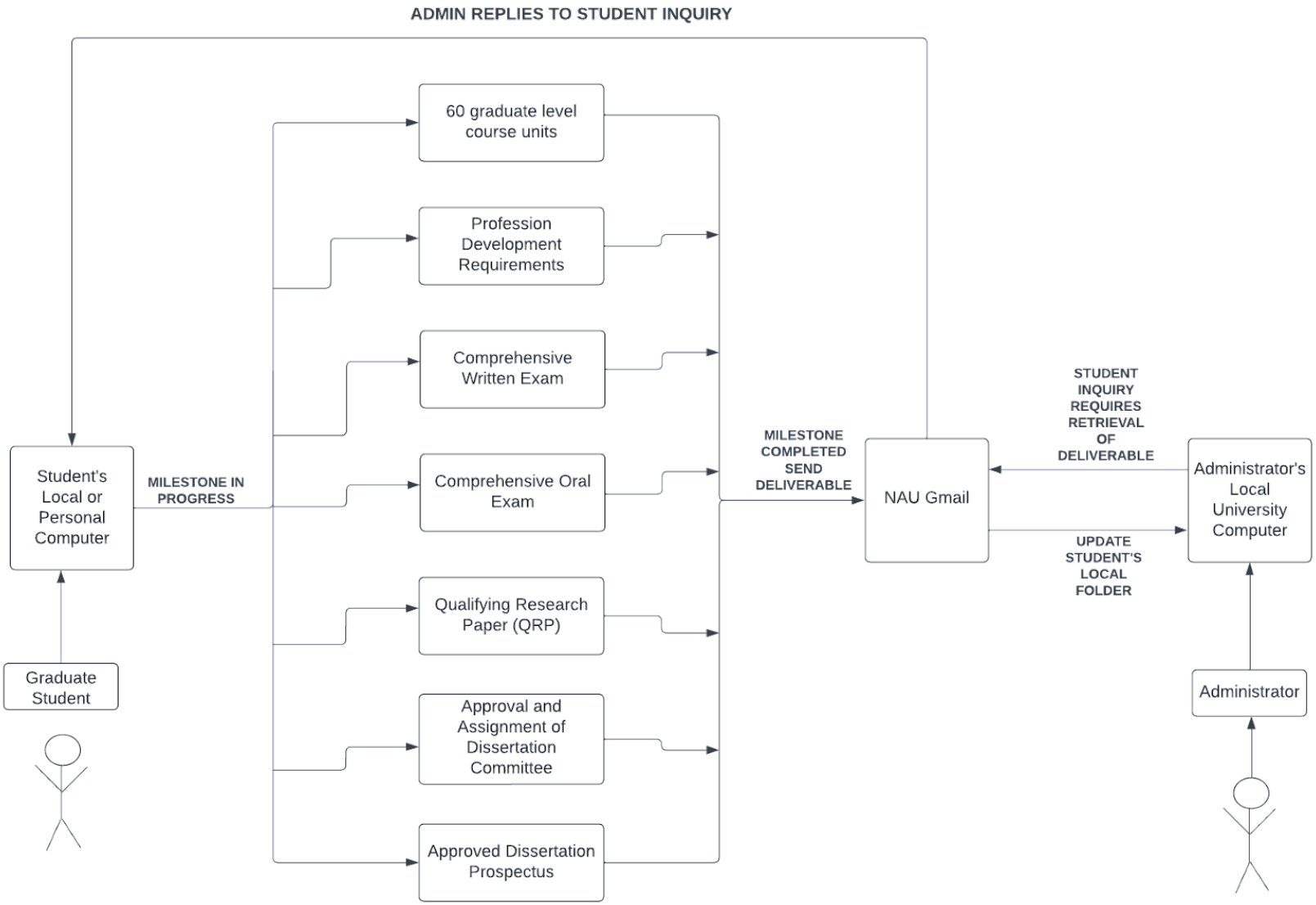
2.0 Problem Statement

Due to the subjectivity and intensity of the milestones outlined above, a standard LMS, such as Blackboard Learn, is not able to integrate a graduate program into its delivery and grading system. Feedback, however, facilitates learning from one's mistakes and most students recognize its value immediately, especially once it's removed from the learning process. In order for the NAU C&I doctoral program to maintain a level of accreditation, and for the sake of the students, an alternative way to track milestones must have been implemented.

At present, Gretchen and Michele are having graduate students funnel all deliverables to a single university computer via email. After the acceptance of a graduate student into the C&I doctoral program, a desktop folder is created on said local university computer titled with the student's name. Upon receival of a deliverable, Administrative Services Assistant, Michele then sorts the deliverable into the students appropriately named desktop folder. No further folder hierarchy or file organization is carried out past creating the student's desktop folder. This folder and file structure is trivial yet convenient for the administrator that has to continually update student data.

The flaws of this folder and file structure are revealed once a deliverable must be retrieved from a student's folder. Graduate student grading and submission inquiries are achieved by emailing Michele directly, who then browses the files locally, and provides feedback via email. The NAU C&I doctoral program general workflow is outlined for further clarity in Figure 2.0.1 below. In this feedback system, Michele must hope that every deliverable is appropriately named, otherwise she will have to manually sort through each deliverable and form to find what she needs and get back to the student in a reasonable amount of time. As stated above, student's place value in the feedback process implemented since grade school and that fact persists into graduate school. Due to the number of graduate students enrolled in the C&I doctoral program, the volume of inquiries, and the subjective nature of the students' milestones, this feedback process can become quite inefficient and stressful for both parties involved.

Figure 2.0.1 C&I Doctoral Program General Feedback Workflow



3.0 Solution Vision

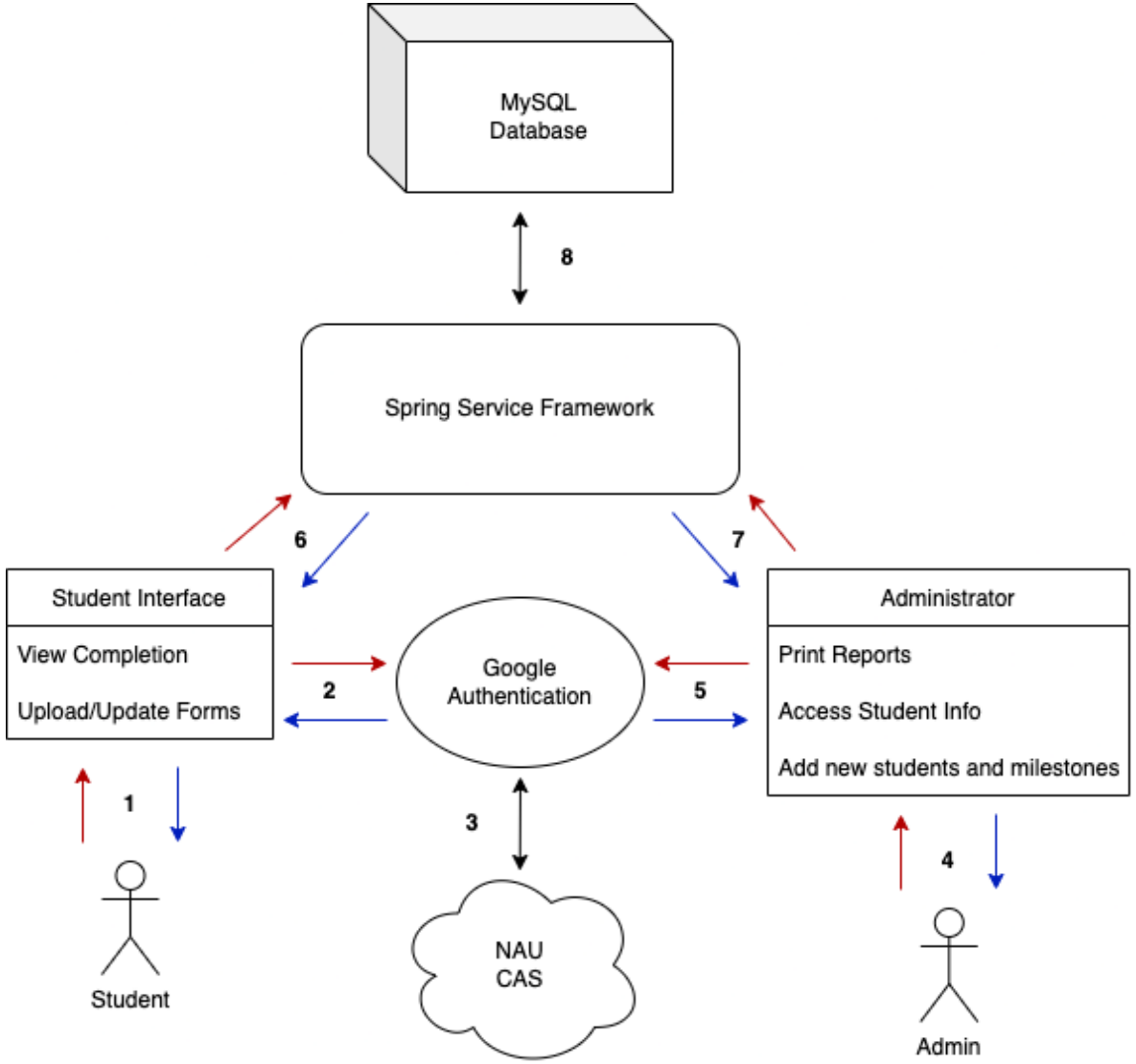
The requested product provides a clear way for PhD students to view their progress throughout their degree. This is provided by a web application accessed through the NAU login, and displays the students information graphically. The students upload their documents and progress is updated immediately. Additionally an administrator view provides ways to view and download files, as well as add new students and administrators. Data and files are stored remotely, but are accessed as the web application is used.

Key features to be provided:

- Student Interface
    - Display of completed and uncompleted milestones based on student provided files
    - Uploaded files will immediately be updated and displayed in the completion bar
    - Options to change settings (font size, colorblind settings, etc.)
- Administrator access
    - Access to individual student information and reporting statistics from population options (current, graduated, all, etc.) and downloading student files
    - Permissions options for adding new students and administrators
- General
    - User login system
    - Only NAU accounts will have access

The flow of data is shown below in figure 3.0.1 and indicates how it is moving within the system. The administrator and student data move identically throughout the system, with additional permissions granted to the former. Both student and administrator will have access to a unique interface which requests login verification and stored data. Communication between the interface and other components are handled by a server side program, and requires a consistent internet connection. Following the given structure, it will provide quick response and updates to student and administrator data, as well as protecting user data and providing it only to those who should have access to it.

Figure 3.0.1 Data Flow Diagram



4.0 Project Requirements

4.1 Functional Requirements

All products require purpose, and defining the desired functionality essentially creates the final product. Definition of these requirements have come from the minimum desired product, and many additional requested features. The following are the

4.1.1 User Interface

The user interface is the front facing view of the product and provides all of the data necessary for the user. While the view varies slightly based on user privileges - covered in section 4.1.3 - the interface will include the progression of milestones and the ability to upload and download documents. Additionally, settings are required to improve the accessibility for all students. These include the ability to increase font sizes, additional font options, and color adjustments.

4.1.2 User Upload and Download

The basis for this entire program is to track progression of the doctoral student's milestones. This must be done by the student completing them, and having the appropriate paperwork associated with these. To track progress, the students will upload their documents using the user interface. This will do two things, one being a database update to display completion on the user interface, and the other storing the file on the school server.

The stored files will maintain a hierarchical structure that matches the administrators local system for consistency. Students will have access to items within their personal folders, and the administrator will have access to all student folders. Downloading will allow the administrator to update their local system and will be accessible through the administrator panel.

4.1.3 Administrative Accessibility

Administrative privileges are required to faculty for adding students and modifying milestones. Using the administrator panel, students and other administrators can be added. The database users are students by default, and administrative privileges are an additional setting that can be set for faculty.

4.1.5 NAU Login

Login functionality allows all users to access their own information, and no one else can access this. Administrators are the exception and will have access to all information, but are faculty and not other students. Implementation of this will allow students and faculty to access their page with standard NAU login credentials. Filtering is necessary and will provide non-NAU accounts with access denied, or NAU accounts not added by an administrator with a similar screen displaying the C&I information and basic grad school information.

Logout functionality will also exist. Being tied to the school account login, this provides many accessible websites with personal information. The ability to logout protects the user from information being accessed. Logging out either through our application or any of the school services will entirely log the user out. Both the school login information and two-step authentication will be required to access these services again.

4.2 Performance Requirements

Ensuring our product meets the performance requirements requires specific and testable goals. These requirements are based on the minimum viable product, additional feature requests, and the functional requirements. The following requirements are:

4.2.1 Authentication Speed

The time it takes to login to our application will likely be one of the most notable points of time lag for users. Ensuring that the time from a user submitting their credentials to being granted access to the application be as short as possible is essential. Ideally we are looking for the total time it takes to log into our application to be less than one minute.

4.2.2 File Upload/Download Speed

Uploading or downloading documents can take a varied amount of time depending on the length of the document and the internet connection of the user. Due to the variability of the response time, we will be testing the upload and download speeds using a file with a fixed size. In testing we want a five page pdf document to have an upload and download time of less than thirty seconds.

4.2.3 Application Readability

Ensuring the application is readable to as many users as possible is essential to ensuring its efficacy among a diverse group of potential users. In order to ensure the readability of our application, we will conduct focus group testing of our application's interface. The goal we are looking for is at least 70% of respondents' approval of our design.

4.2.4 Progressive Database Response

As the database holding all the files grows, the time for an administrator to receive a report will increase. We will be testing the database's ability to produce a report based on the files inside of it. The time for the database to generate and display a report will be under 100 milliseconds.

4.3 Environmental Requirements

Our client, Gretchen McAllister, Ph.D., imposed a number of environmental project constraints during our first meeting. The first constraint related to access: Dr. McAllister made it clear that the website application would be a College of Education (COE) website application and that it would eventually be accessible via the NAU website. This association with the NAU website entails that our website application will be a representation of the university and must be kept professional, appropriate, and relatable wherever possible. Not only do18es our website application have to consider the reputation of the university, but it also must adhere to the strict authentication and protection of privacy policy that the university administers on a daily basis. In our case, NAU students are issued an NAU gmail account upon admission that will then be used throughout their years at the university. It is imperative that NAU grad students use their linked NAU gmail account and password to access our website application. This ensures consistency across any other COE website application they might be using at the time and guarantees that only NAU students are able to access the web app. It is then up to us developers to ensure that the correct grad students are able to access the website application when they are supposed to.

Team What's Up Doc is unable to assume any given system that a graduate student could be accessing the website application from. Therefore, we must account for all platform possibilities so that a grad student accessing the web app from their Mac sees the same content as the grad student that is accessing from their mobile phone.

The last environmental constraint our client placed on us relates to the overall usability of the website application. Dr. McAllister made it abundantly clear that her C&I graduate

students are a diverse group in many different ways. This diversity is most apparent in the graduate students' age disparity and how it affects their technical abilities. Dr. McAllister argued that our website application user interface must be intuitive and accommodating to graduate students ranging in all types of technical ability. A website application that is difficult or tedious to use will ultimately be unappealing to any user, regardless of their technical abilities, so this is a key requirement to uphold.

5.0 Potential Risks

- **Database Losing Files**
    - In the age of data, a growing worry for many people is the inevitable loss of data. Whether that be through data corruption or physical system damage, dealing with data loss is a very real risk. Losing a graduate student's submitted work is unacceptable and therefore this risk must always be accounted for.
    - There is a moderate likelihood of this occurring, as there are many ways that a computer can be damaged, or information can be scrambled.
    - To counter this possibility, we will be utilizing backups of the database, so that in the event of a loss, the backups can restore the files.
    - The severity of this risk is quite high due to the inherent academic integrity that each graduate student is adhering to. If a particular graduate student uploaded a deliverable on time but eventually became corrupted, it becomes difficult to recognize whether the student intentionally turned in unfinished work or your system resulted in corrupted data.
- **Invalid Documents**
    - There is the potential for improper documents to be uploaded by users.
    - Empty documents or the incorrect forms being uploaded to a user's progress can lead to inaccurate progress reports and future confusion if not detected early.
    - There is a small chance that a user would upload an incorrect document unintentionally, and there is little to no reason for it to be done on purpose.
    - Uploaded files will be viewable through the application, allowing for users to confirm or correct uploaded documents.
- **NAU Creating a Competing Application**
    - NAU is regularly updating both BBLearn and Louie, their primary academic tracking applications. It is possible that they either implement a third application or incorporate a similar extension into Louie or BBLearn that would accomplish a similar purpose as our application.
    - If NAU does implement a competing program, that program would become the official tracking program. In that case our program would become unnecessary.
    - As NAU has yet to implement such a program, it is not very likely that they would do so in the immediate future.
    - Should NAU create a replacement program, the files from our database could be downloaded and uploaded to the new program.

- **Unauthorized User Access**

- Recall that this website application will be an NAU College of Education web app intended to be accessed by graduate students and administrators. Any COE related program must assume that there is student information to protect at all times. This entails a rigorous method of user authentication to ensure that the right people are accessing the right student information and the wrong people are unable to see past the login screen.
- The likelihood of a student accidentally typing in another student's gmail information and password is slim. There is a higher likelihood of a malicious person somehow gaining access to a students gmail and password information and further infiltrating their accounts from there. We can only ensure that the correct NAU grad students are able to log into the website application, therefore, if a graduate student leaks their own gmail and password, it is up to them to recognize the breach and act accordingly through a password change.
- The severity of this particular risk depends on our own functional requirements. If an abundance of student information can be expected to be found either in a deliverable or on the website application itself, then it is expected that this information be abstracted even further from the user. For example, if there is a dedicated student information page, then this page should have a lock on it at all times which requires third-party authentication, such as a push to DuoMobile, to unlock. Likewise, if a particular deliverable contains sensitive student information, the administrator creating the deliverable upload page can mark it as sensitive which will require a similar third-party authentication in order to view it.

6.0 Project Plan

The plan for executing this product is to initially implement the web application interface, database and communication framework. Having a working interface capable of requesting and displaying data allows easy viewing of successful operations. The database stores all appropriate data of completed milestones and is accessible via data requests. Communication is arguably the most important part of the system, as without it no requests or data can be transmitted. Following successful initialization of these components, additional functionality and tuning of user views will be added.

6.1 Product Development Milestones

Milestones serve to track completion of large tasks, and allow scheduling tasks for completion of the overall project. The milestones currently planned for are:

First/highest priority***:

- Initialize largest components
    - Website
    - Database
    - Connections

Second***:

- Add login verification
    - Test and verify retrieval specific to user

Third***:

- Add administrator permissions
- Add functionality to website and framework
    - File upload/download
    - Admin accessibility of student progress

Fourth***:

- Additional administrator functionality
    - Give administrator user permissions to set student/administrator
- Website interface customization options
    - To meet accessibility requirements

Figure 6.1.1 Gantt Chart

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Gantt Chart Placeholder

Included will be (notes):

- Completion milestones
    - Start and projected completion dates
    - Dependencies
- Better naming conventions
    - Will make previous section bullet points more clear
- Landscape format
- High contrast and visibly clear

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7.0 Conclusion

Learning from one's mistakes is an invaluable part of the education process, however it must be facilitated through a feedback process. If said feedback process is denied, there is a clear barrier the student must pass through before they can reflect on their work. Team What's Up Doc aims to reimplement an efficient feedback process for graduate students enrolled in the NAU Curriculum and Instruction doctoral program through an accessible website application. A working College of Education website application would introduce an efficient feedback mechanism for C&I graduate students and offload a tremendous amount of stress for our clients Gretchen and Michele. In this Requirements Specification document, Team What's Up Doc identified the functional, nonfunctional, and environmental requirements needed in order to flesh out the website application and concretely determine what is considered a "finished" product to both ourselves and our client. With this Requirements Specification agreement in mind, Team What's Up Doc will be able to move forward in the demo and prototype development with clarity.

8.0 Glossaries and Appendices

Placeholder - If necessary for final submission

9.0 References

[1] Hanson, Melanie. "College Enrollment Statistics [2022]: Total + by Demographic." *Education Data Initiative*. 22 Jan. 2022. <https://educationdata.org/college-enrollment-statistics#:~:text=Report%20Highlights.,students%20are%20in%20graduate%20programs.>.