1. **Please list out changes in directions of your project if the final project is different from your original proposal (based on your stage 1 proposal submission).**
    a. We changed part of the datasets compared to the stage 1 proposal.
    b. We changed some attributes of the tables to make it more reasonable.
2. **Discuss what you think your application achieved or failed to achieve regarding its usefulness.**
    a. We believe our application achieved its usefulness, because our application enables users to search players' information based on the user's interest. We also allow the user to check the specific statistics of each player by clicking on the players' names. Therefore, users could learn more about players they are interested in through this web application.
3. **Discuss if you change the schema or source of the data for your application**
    a. We do not change the schema or source of the data for our application.
4. **Discuss what you change to your ER diagram and/or your table implementations. What are some differences between the original design and the final design? Why? What do you think is a more suitable design?**
    a. We do not change our ER diagram and table implementations.
5. **Discuss what functionalities you added or removed. Why?**
    a. We removed the compare function from our initial proposal and we didn't include the video of each player on our website. Because the workload would be too heavy if we want to get the video for 217 players, and some players don't even have the highlights.
6. **Explain how you think your advanced database programs complement your application.**
    a. We used a trigger to determine whether the ID that the user added is consecutive or not. If the ID is too large, the trigger will automatically change it to the next one in the sequence. With this trigger, we make sure that the user will not mess up the database.
    b. We implemented the stored procedure to assign a rank to each player in the database. We developed a function to calculate their ability value. We give each player their rank according to their value. With the stored procedure, we allow users to check the players of each rank which is a significant feature .
7. **Each team member should describe one technical challenge that the team encountered. This should be sufficiently detailed such that another future team could use this as helpful advice if they were to start a similar project or where to maintain your project.**
    a. We encountered difficulties when we tried to connect our project to the gcp database. The main issue was caused by we forgot to generate the json file under gcp database and save it to the local. Then we use SqlAlchemy to create a connection pool.

b. We had difficulties when we designed and completed the frontend work, because all of us are beginners for frontend work. For the complex forms, modals and buttons, we chose to use Bootstrap as a frontend framework to simplify the frontend development. The reason is Bootstrap provided templates for these elements.
c. We also had problems designing the datasets and related schema at the beginning. The solution is we searched for tons of related datasets and brainstormed together to choose what field of datasets we should keep along with its usefulness.
d. When accessing the database from the backend with python, we have issues when trying to execute the query directly with arguments that contain quotation marks because the query itself is rounded by double quotations and python will not be recognized as a single quotation instead a double and treated as a string. To fix the issue, we first use text to translate the whole query to a recognizable form and store it in a variable, then we execute the variable directly to avoid the issue.
e. When we tried to run our application on one of our teammates' laptops, we encountered an issue to get a local issuer certificate when using requests in python. The solution we found out is to manually provide the server certificate in the verify key.

8. **Are there other things that changed comparing the final application with the original proposal?**
    a. Not much has changed compared to the original proposal, only some small modification on the data that we show to the user interface based on the data set we collected, some data are related to the NBA player that we previously didn't discover such as college and draft, and we add them to the web implementation.
9. **Describe future work that you think, other than the interface, that the application can improve on**
    a. One thing that I think we can improve is to create a dynamic data set instead of the static one that we are using right now. The current data set we are using is the NBA players in 2022, which is limited and past data. I am thinking about obtaining real time data along with this new season playing, and updating player statistics along with each game.
    b. Also, I think we can attach photos and videos of the highlights of each player after clicking into the player info page, so that users can know the player better instead of just reading the data.
10. **Describe the final division of labor and how well you managed teamwork.**
    a. We completed the project by pair programming via zoom. The teamwork is managed pretty well.