ISSN: 2289-7844 | e-ISSN: 0127-9750
DOI: https://doi.org/10.37134/jictie.vol12.1.6.2025

Journal of ICT in Education (JICTIE)
Volume 12, Issue 1, Pages 75-88, 2025

Research Article

Development of a MATLAB-Based CGPA and Final Exam Goal Calculator to Enhance Academic Planning in Higher Education

Nor Shafiqah Ahmad Jamil[1], Nurhazirah Mohamad Yunos[1,2*], Aishah Mahat[2], Ahmad Khudzairi Khalid[2], Nur Syamilah Arifin[2], Norbaiti Tukiman[2]

[1]*Department of Mathematical Sciences, Faculty of Science, Universiti Teknologi Malaysia, Johor Bahru, Johor, Malaysia; nshafiqah245@gmail.com*; *nurhazirah7@graduate.utm.my*
[2]*Mathematical Sciences Studies, College of Computing, Informatics and Mathematics, Universiti Teknologi MARA, Pasir Gudang Campus, Johor, Malaysia; nurhazirah12394@uitm.edu.my*; *aishahmahat@uitm.edu.my*; *ahmad4829@uitm.edu.my*; *nursyamilaharifin@uitm.edu.my*; *norbaiti289@uitm.edu.my*

Received: 14 August 2024; Revised: 29 September 2024; Accepted: 10 April 2025; Published: 30 April 2025

**corresponding author*

Abstract

In higher education, the Cumulative Grade Point Average (CGPA) serves as a vital metric for assessing academic performance and shaping students' future opportunities. However, many students struggle to plan their CGPA since they have trouble predicting their final examination marks to be achieved after getting the carry marks. Hence, this study addresses these challenges by developing an intuitive CGPA and final examination goal calculator using a graphical user interface (GUI) in MATLAB. A comprehensive flowchart for the development process is also provided, along with a brief explanation of the interface for both calculators to guide users. Additionally, demonstrations of the calculators are illustrated through examples. A user perception survey was conducted to evaluate the usability, user experience, and interface quality of both calculators. The findings suggest that these calculators have a positive impact on students' academic planning at two key stages: the beginning of the semester and the end, after receiving ongoing assessment marks.

Keywords: CGPA, Final Examination, MATLAB, Calculators, GUI

INTRODUCTION

Students in higher education aspire not simply to earn good grades, but also to establish specific academic goals. The Cumulative Grade Point Average (CGPA) is an important metric for evaluating a student's academic achievement over time, and it is relevant to both students and educational institutions. CGPA is utilized globally to assess overall academic achievement, influencing possibilities such as scholarships, internships, and job placements (Ramadhianti & Soegoto, 2024; Hashim, 2012). Many students, particularly those who struggle with mathematical computations, encounter challenges beyond merely measuring their CGPA. When students must estimate the marks required in their final exams to fulfil certain academic goals, such as maintaining a set CGPA or improving their academic standing, they face a substantial obstacle.

Despite the critical role that the CGPA plays, there is a lack of accessible tools that can both calculate CGPA and predict the marks needed in final exams. Many students are unsure of how to plan their academic strategies effectively. This is because the current software overlooks the necessity for final exam mark predictions in favor of merely computing or forecasting the CGPA (Haqem, 2024). This significant functional gap causes ambiguity in academic planning, making it more difficult for students to decide what to do and how to modify their efforts, particularly after learning about the carry marks. The predicted marks that must be earned on the final exam may be difficult for the students to determine. Several strategies have been investigated recently to raise test results, grade point averages, and cumulative grade point averages of pupils (Yogendra & Andrew, 2017).

This study proposes to use MATLAB to develop applications, namely the CGPA and Final Examination Goal Calculator, to solve this problem. By having these calculators, students can predict the marks they must obtain in final exams to obtain their desired grade, as well as calculate their current CGPA. The goal of this software is to enable students to confidently take charge of their academic progress by providing them with an offline tool that blends accuracy, usability, and reliability. This research aims to: (1) create a CGPA calculator using MATLAB; (2) create a final exam goal calculator using MATLAB; and (3) assess the usefulness and efficiency of the created calculators in supporting students' academic planning.

LITERATURE REVIEW

Introduction to Cumulative Grade Point Average (CGPA)

The cumulative grade point average (CGPA) is a crucial measurement in the field of education that serves as a quantitative representation of a student's academic performance over time. CGPA is widely used in educational institutions all around the world and is very important to both students and educational institutions. Various measures can be used to assess a student's academic achievement, including test scores, grade point averages, and cumulative grade point averages (Yogendra & Andrew, 2017; Nurudeen *et al*., 2023). This section will delve into CGPA, explaining what it is, why it is important, and how it is calculated.

CGPA, or cumulative grade point average, is a measure of academic achievement that is used to evaluate the performance of students in tertiary education (Sarah *et al*., 2020; Nor Adibah *et al*., 2017). CGPA is normally calculated based on the grades or marks earned by a student in various courses or subjects over a specific period. The cumulative grade point average (CGPA) is a key metric used to assess a student's academic performance (Bhushan *et al*., 2023). It is determined by averaging the student's performance in individual semesters, also referred to as the semester grade point average (SGPA). The CGPA is commonly calculated on a scale of 4.0 or 5.0. Furthermore, it is important to keep in mind that the number of grade points (represented by the letter n) may differ throughout institutions based on institutional and regional preferences. Theoretically, 'n' can take on any number below 100, but in practice, 'n' has never been more than 12. For instance, 'n' tends to range between 4 and 7 in Nigerian tertiary institutions, with 5 being the most common value (Omotosho, 2013).

The cumulative grade point average (CGPA) is significant because of its broad impact on students and their educational experiences. It is critical in unlocking important opportunities like scholarships and awards, as well as defining graduation requirements and postgraduate options. Furthermore, companies continue to use CGPA as a key component in evaluating job candidates. Based on the study conducted by Yogendra and Andrew (2017), candidates with higher CGPAs are most likely to be recruited. This preference is founded on the belief that a high CGPA symbolizes not only academic performance but also

vital characteristics such as discipline, determination, and problem-solving skills. Thus, a CGPA's importance extends beyond the classroom as a measure of a person's skill and readiness.

General Formula of Cumulative Grade Point Average (CGPA)

The calculation of CGPA typically involves assigning a numerical value to each grade received in courses and then averaging these values to obtain an overall score (Yogendra & Andrew, 2017). This formula is used by various educational institutions with minor alterations, but the core components remain consistent. According to Omotosho (2013), the general formula for CGPA can be expressed as:

$$CGPA = \frac{\sum_{i=1}^{i=N}(GP_i \times CR_i)}{\sum_{i=1}^{i=N} CR_i}. \quad (1)$$

Here, $\sum$ represents the sum of all courses taken, where GP_i is the grade point for all scores earned by students, CR_i is the credit hours (weightage) for each course taken, N is the total number of courses.

There is a lot of variation in grading methods between educational institutions and countries like A, B, C, D, F, and A, B+, B, C+, C, D, F, and many more. In the grading system, every letter has an equivalent point value. The A or A+ has the greatest value, such as 4.00, followed by B or B+ with the next higher value, and usually the grading system ends on F with the lowest value of 0.00, depending upon the policy of the institution (Hussain *et al*., 2014). For instance, a study conducted by Ezeh *et al*. (2012) highlighted variations in grading systems across different regions. In the United States, the standard grading scale typically consists of five grades on a four-point scale, ranging from A (4.0) to F (0.0). In contrast, the grading system implemented by the Nigerian University Commission (NUC) employs up to six grades on a five-point scale, while European universities often utilize the European Credit Transfer and Accumulation System (ECTS), which spans from A (10) to F (0.0), where 10 is considered excellent and 0 is considered a failure. Understanding these variations is essential since they have an immediate effect on CGPA calculations.

Existing Software for a CGPA Calculation

In the past, students had to manually compute their CGPA by converting letter grades into numerical equivalents, calculating averages, and then determining their CGPA. However, in today's digital era, the process of calculating cumulative grade point averages (CGPA) has evolved significantly. This section of the literature review delves into the landscape of current software and tools created for CGPA calculation, including their features, benefits, and limitations. Due to the availability of such tools, the previously manual CGPA calculation procedure has been simplified, giving students and educators better alternatives.

There are various CGPA calculator apps available on both the Android and iOS platforms. These apps offer convenience and portability, allowing students to calculate their CGPAs on the go. They often come equipped with additional features such as grade predictions and credit planning. For instance, the Android University Management System is a notable example of software that incorporates a CGPA calculator. This system, which is intended for both students and university faculty members, has several features that are meant to speed up academic procedures (Jewel *et al*., 2017). There also exists a mobile-based application called the Grade Point Average Monitor (GPAM) Android application, which is an innovative tool created to assist users in monitoring their academic achievements. By allowing users to set GPA targets and offering insights on their academic achievement, GPAM goes beyond the traditional CGPA calculation (Umar *et al*., 2018). This software meets the demands of students aiming for goal-oriented academic performance and self-directed learning.

In addition, there is also a web-based platform called UniPlanner designed to enhance students' overall academic experience. These planners enable students to make the most of their time management, plan their daily schedules, and improve their academic performance (Zukriyani & Azizan, 2023). UniPlanner's features may indirectly contribute to CGPA improvement by helping students stay organized and on track with their studies.

These existing software and tools illustrate how educational technology has been developed. They provide a variety of student demands, from basic CGPA calculation to more extensive academic planning and support for self-directed study (Ghafar *et al.*, 2023; Sudin *et al.*, 2022; Zamzuri *et al.*, 2024; Azman *et al.*, 2024). To ensure that new solutions, like the MATLAB application suggested in this research, continue to satisfy the changing demands of students and educational institutions, researchers and developers must take these tools into account as they design new products.

METHODOLOGY

Graphical User Interface (GUI) in MATLAB

MATLAB is a leading mathematical software extensively used for data analysis, data visualization, algorithm development, and numerical computations. To calculate the CGPA and the expected Final Examination marks to be obtained, this study implemented a graphical user interface (GUI) using MATLAB AppDesigner. The calculator's layout was designed using the interactive UI components provided in MATLAB App Designer (version R2023a). It operates within an external environment, with the application's code written using an external editor that integrates smoothly with a layout view. The interface consists of two main views: Design and Code. These can be accessed via a button on the design page. The Design view allows users to organize the application's layout, while the Code view requires coding for each tool to define the data types and characteristics to be included in the code.

The initial step in creating the CGPA and Final Examination Goal Calculator involves designing the GUI and layout in the design view (Alazzawi et al., 2023). During this process, visual components are added using a drag-and-drop method. The layout is crafted to align with the calculators' objectives. Next, the code to run the function was programmed in the code view. The process of creating both calculators is illustrated in Figure 1.

The Flowchart for the Cumulative Grade Point Average (CGPA) Calculator

As mentioned above, the GUI consists of two main views, which are design and code. To make a calculation, a specific code must be entered at the "Push Button". Calculating the CGPA requires the formula, and it is defined as follows:

$$CGPA = \frac{\sum_{i=1}^{i=7}(GP_i \times CR_i)}{\sum_{i=1}^{i=7} CR_i}, \quad (2)$$

where $\sum$ represents the sum of all courses taken, where GP_i is the grade point for all scores earned by students, and CR_i is the credit hours (weightage) for each course taken. Note that the calculator accommodates up to 7 courses only. By using Equation (2), we plan the algorithm for calculating the CGPA, and it is represented in the form of a flowchart illustrated in Figure 2.

Based on Figure 2, to calculate the current CGPA, the user needs to insert the input of the previous CGPA result and total credit hours (if any). By default, it is 0 if the student is in his/her first semester. After that,

the user is required to insert the current semester credit hours and the expected grade to obtain for each course. The calculation is set to follow the grading system used in Universiti Teknologi MARA (UiTM Academic Regulations, 2011).

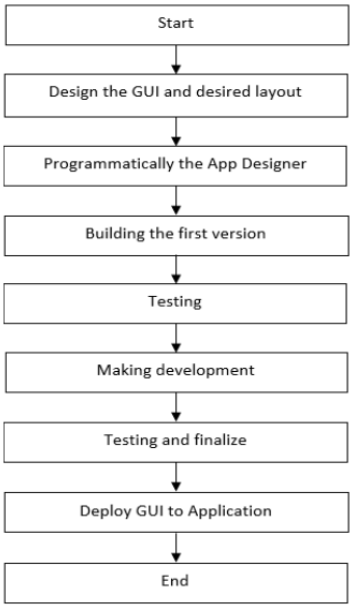

Figure 1: The flowchart of creating the CGPA and Final Examination Goal Calculator in GUI MATLAB

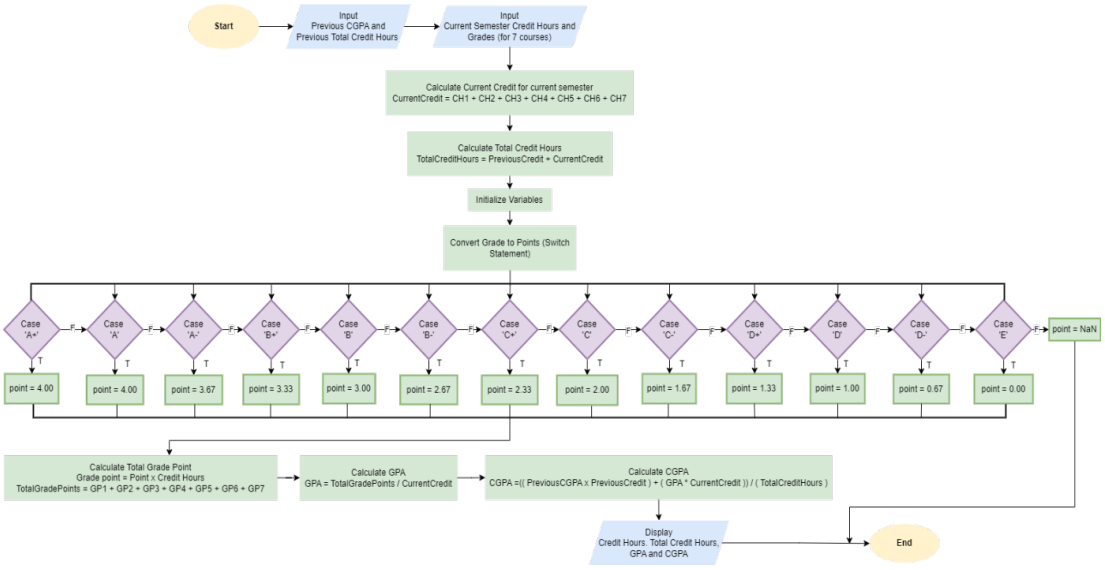

Figure 2: The flowchart of calculating the CGPA for up to seven courses

The Flowchart for Final Examination Goal Calculator

Similarly, to calculate the required final examination marks, we need to have a formula. Hence, the formula for calculating the required final examination score can be expressed as

$$Required\ Final\ Examination\ Score\ =\ (Estimated\ Final\ Examination\ -\ Carry\ Marks\ obtained)\ \times\ \left(\frac{100}{Weightage\ for\ Final\ Examination}\right). \quad (3)$$

According to Equation (3), the estimated final examination marks, the carry marks obtained, and the weightage of the final examination must be known to calculate the required final examination score. By using Equation (3), we develop an algorithm for calculating the required final examination marks and illustrating it through a flowchart in Figure 3.

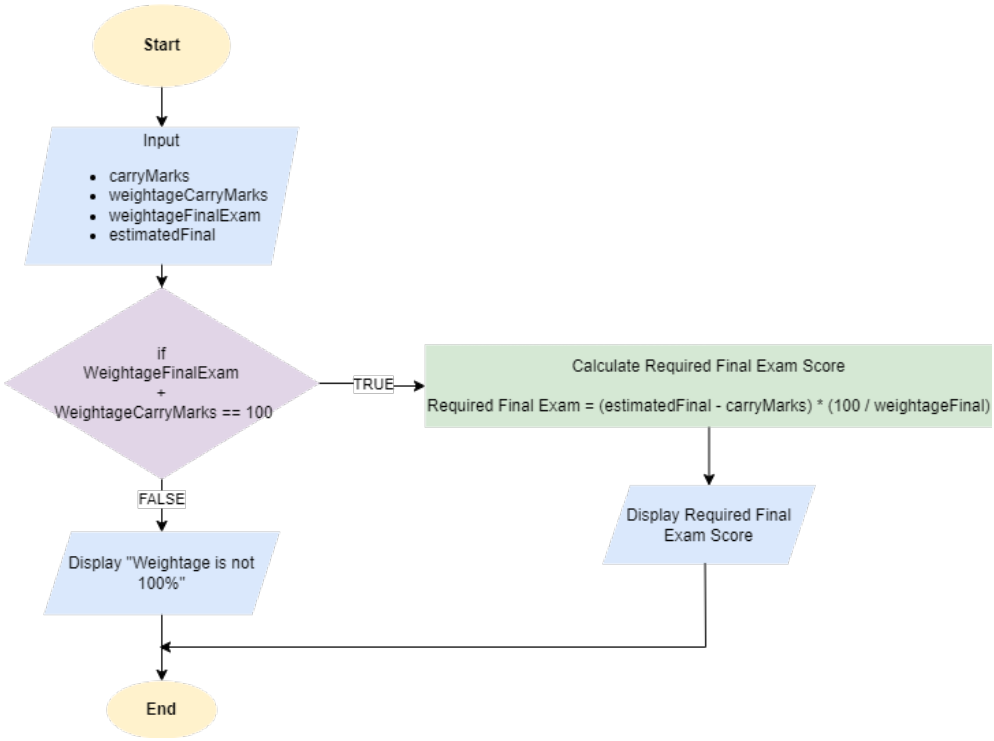

Figure 3: The flowchart of calculating the final examination marks

Based on Figure 3, after inserting the inputs of estimated final examination marks obtained, the carry marks, and the weightage of the final examination, there is a restriction on the weightage for carry marks and the weightage for the final examination. The sum of the weightage for carry marks and the weightage for the final examination must be equal to 100%. If the total weightage is not equal to 100%, it indicates that the weightages were not set correctly, and the calculator will display the message "Weightage is not 100%". Hence, the user needs to make amendments to the input.

By using the developed algorithm in Figures 2 and 3, we propose two GUI MATLAB namely CGPA Calculator and Final Examination Goal Calculator. The detail of the interface of the GUI is explained in the next section.

RESULTS AND DISCUSSION

Cumulative Grade Point Average (CGPA) Calculator

The GUI generally consists of two functions: (1) to calculate the grade point average (GPA); and (2) to calculate the cumulative grade point average (CGPA). Figures 4 and 5 demonstrate the overall layout of the CGPA Calculator and the interface when the user inputs all the required information, respectively.

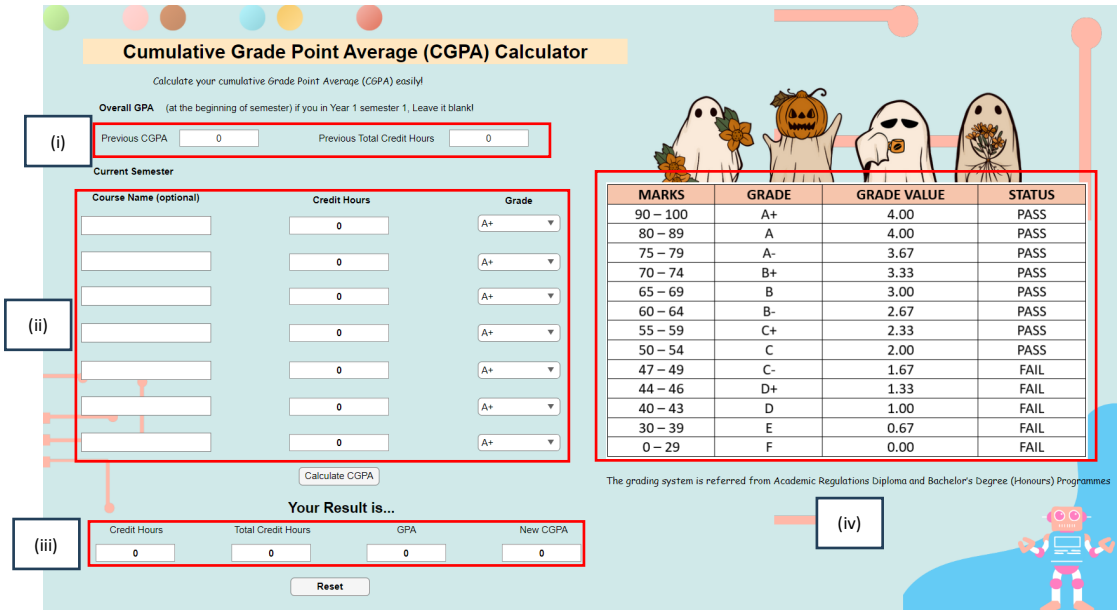

Figure 4: The interface of the Cumulative Grade Point Average (CGPA) calculator.

As shown in Figure 4, the calculator is divided into three main tasks: (i) and (ii) require user inputs, with (i) focusing on previous semesters and (ii) focusing on the current semester for the expected grades. If the user is in their first semester, the inputs for (i) can be set to 0. Once all the required information has been entered, the expected GPA and CGPA will be displayed in section (iii). Additionally, there is a remark on the marks provided in section (iv). Note that this remark is based on the grading system used at Universiti Teknologi MARA, and different universities may have different mark ranges for each grade. For example, to achieve a B for a particular course, the total marks obtained from the sum of ongoing assessments and final examinations must be between 65 and 69.

To get a better picture of the implementation of the CGPA calculator, Figure 5 illustrates the interface where the users provided the necessary information. From the figure, the previous CGPA and total credit hours are entered as 3.78 and 34, respectively (as seen in section (i)). There are five courses taken for the current semester, with the credit hours for each course and the expected grade to be achieved entered as shown in section (ii) of Figure 5. After entering all the information in sections (i) and (ii), the user needs to click “Calculate CGPA” to display the credit hours for the current semester, the total credit hours, GPA, and CGPA. Here, it is shown that the GPA is approximately 3.286, and the CGPA is 3.636.

Next, if the user is satisfied with the expected new CGPA, they must take the required grades for each course seriously. For example, if the expected grade for the Introduction to Transport course is a B, according to section (iv) in Figure 5, the marks needed to achieve a B are between 65 and 69. These marks are the sum of the ongoing assessment (carry marks) and the final examination marks. Therefore, they should focus on securing the highest possible marks in their ongoing assessment before preparing for the final examination. This is important because the ongoing assessment typically covers only some chapters, whereas the final examination usually encompasses all the chapters.

The GPA is calculated based on the weighted average of the grades in the current semester, and the CGPA is a cumulative measure including both past and current semesters by using Equation (3). The aim of this calculator is to be a reference for the students to set their target in achieving a better CGPA through

focusing on the courses that they are confident with. If the expected CGPA is beyond or less than their expectation, they can always change the grade for certain courses by clicking the “Reset” button. Therefore, this calculator can be a great help for the students in the beginning or in the middle of the semester to have a target for their CGPA during their studies.

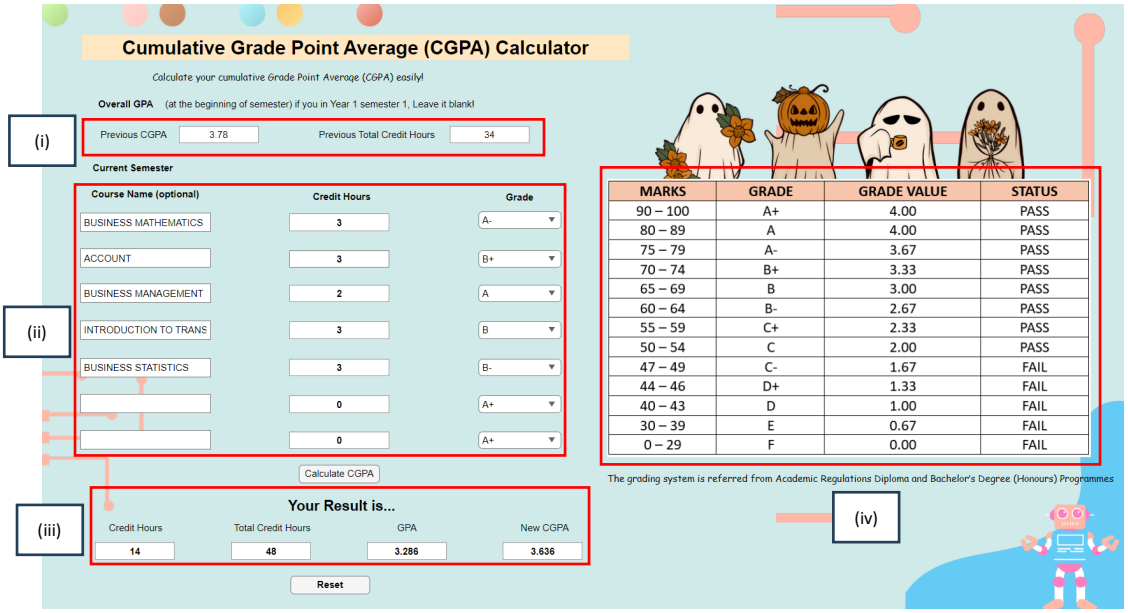

Figure 5: The demonstration of the Cumulative Grade Point Average (CGPA) calculator.

Final Examination Goal Calculator

The standard assessment process consists of two components: ongoing assessments, also known as carry marks, and the final examination. The weightage of these components may vary across different courses; for example, some courses may allocate 40% to ongoing assessments and 60% to the final examination. When using the CGPA calculator, the expected grade represents the overall grade, which is the sum of the ongoing assessment and final examination scores. Once students have set their CGPA target, they can determine the required grade for each course.

For instance, in Figure 5, the user has set a target of grade A for the course "Vector Calculus." According to the remarks in section (iv) of Figure 5, a minimum of 80 marks is needed to achieve an A. This leads to the question: how much should the student score in the final examination if the ongoing assessment marks (carry marks) have already been determined? Students often find it challenging to set a target for their final examination due to the lack of information about the specific marks they need to achieve. To address this issue, a final examination goal calculator has been developed to help students determine the marks they need to obtain in the final examination. Figure 6 illustrates the interface of the final examination goal calculator. Meanwhile, Figure 7 demonstrates the usage of the Final Examination Goal Calculator.

Based on Figure 6, the user is required to input the values for carry marks, the weightage of carry marks, the weightage of the final exam, and the estimated final grade they want to achieve. This calculator is intended for use at the end of the semester, before the final examination is held. This is because carry marks are usually obtained in the last week of lectures. Therefore, after receiving their ongoing assessment marks, students can use the calculator to predict the marks they need to achieve in the final examination.

Once all the required inputs are entered, the calculator will promptly display the marks needed in the final examination.

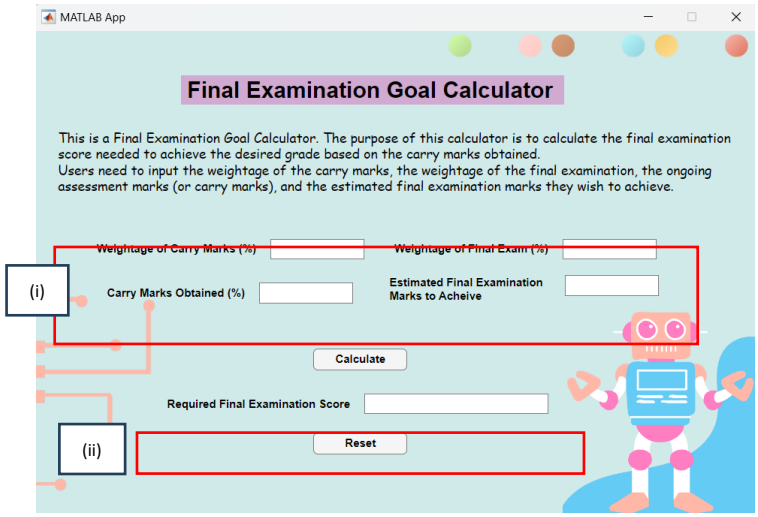

Figure 6: The interface of the Final Examination Goal Calculator.

In Figure 7, the weightage of carry marks is 50%, and the weightage of the final examination is also 50%. These weightages must be set according to the specific course. Therefore, the carry marks value must be between 0 and 50, as shown in Figure 7, where 45% is entered. Next, the estimated marks for the course should be set between 0 and 100, based on the grade the user wants to achieve. For example, if the user aims to get an A, the minimum mark required is 80. Thus, 80 can be inserted into the estimated marks field. By clicking the "Calculate" button, the required marks for the final examination will be displayed. According to Figure 7, the student must score 70 marks or above out of 100 in the final examination to achieve an A for that particular course code.

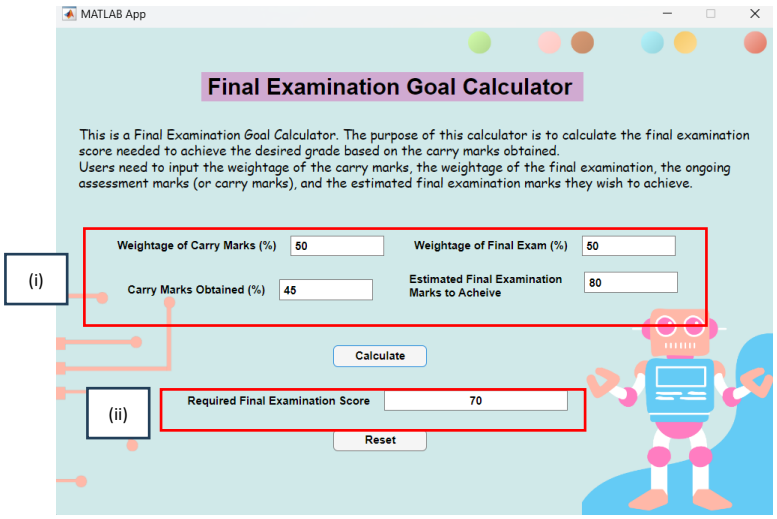

Figure 7: The demonstration interface of the Final Examination Goal Calculator.

The findings can greatly assist students in planning or guiding their answers in the final examination. For example, if a student knows they need to achieve at least 70 marks in the final examination, they can study the pattern of previous final examination questions. By doing so, they can focus on the chapters that carry

the highest marks and contribute towards achieving the required 70 marks. However, this is just a suggestion since the structure of the question might be similar or different from the past year's final examination.

Usability of the Calculators through Users' Feedback

A quantitative study has been conducted to obtain the students' feedback on using both calculators. 30 first-year students from the Business Course filled out the survey. The lecturer introduced the CGPA and Final Examination Goal Calculators at the beginning of the semester and guided the students on how to install as well as use the calculators. Based on Figure 8, the analysis on gender shows 56.7% of respondents are female and 43.3% are male.

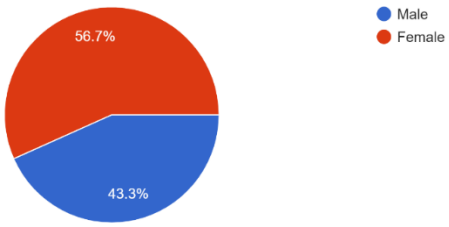

Figure 8: Percentage of gender

The questionnaire was adapted from the Post-Study System Usability Questionnaire (PSSUQ) instrument (Sauro & Lewis, 2012). This test was conducted to assess the usability of the CGPA and Final Examination Goal Calculator among students. The analysis is divided into three main criteria: software usage, user experience, and interface quality. The interpretation scale for the analysis is as follows: 1.00–2.33 (low), 2.34–3.66 (moderate), and 3.67–5.00 (high) (Ahmad, 2002).

Table 1: The user's perception of the Software Functionality for CGPA and Final Examination Goal Calculator

No.	Item	Mean
1	The CGPA Calculator performs all required calculations accurately	5
2	The Final Examination Goal Calculator performs all required calculations accurately	5
3	The software provides results in a timely manner.	5
4	The features of the calculators are sufficient to meet academic planning needs.	4.63

Table 1 shows the descriptive statistics of four items that reflect user perceptions of the software functionality for the CGPA and Final Examination Goal calculators. According to the findings, the mean value for all items is 5, indicating a high degree of satisfaction with the calculator's functionality. However, the lowest mean score is 4.63, with the statement, "The calculators' features are sufficient to meet academic planning needs", implying that there is room for improvement in our software.

Users have provided beneficial suggestions on possible improvements to be made, specifically the addition of features like a save function and print functionality. Such features will greatly improve usability by allowing users to save and share vital data more readily. This feedback is consistent with recognized usability principles, which state that software should adapt in response to user demands and experiences (Nielsen, 1994). The somewhat low mean score on the features indicates that, while users are generally satisfied, there are specific functionalities that could help them with their academic planning.

Table 2: The user's perception of the user's experience while using the CGPA and Final Examination Goal Calculator

No.	Item	Mean
1	I believe that the CGPA Calculator helps me in planning my academic goals starting from the beginning of the semester.	4.6
2	I believe that the Final Examination Goal Calculator helps me in preparing for exams.	4.8
3	I believe that this combination of calculators completes my academic planning, from the beginning of the semester to the end, before sitting for the final examination.	4.7
4	I believe that using these calculators has positively influenced my academic performance.	4.77
5	The calculators can be used in offline mode, making it easier for me to access them without any issues related to internet connection.	4.9
6	Since the software is offline, I don't have to worry about experiencing issues like website traffic or the site hanging	4.93

Table 2 presents the mean scores for user experiences while using the CGPA and Final Examination Goal calculators. Most respondents agreed with the statement, "Since the software is offline, I don't have to worry about experiencing issues like website traffic or the site hanging", which recorded the highest mean value of 4.93. This remark emphasizes the importance of offline accessibility, which allows users to use the calculators without the frequent issues faced with online tools. Next, the statement, "The calculators can be used offline, making it easier for me to access them without any internet connection issues," showed the second highest mean score of 4.9. Consequently, this outcome is consistent with prior studies showing that offline tools can considerably improve user satisfaction and accessibility (Rahiem, 2020). Additionally, users stated that "I can study anywhere without worrying about internet issues", emphasizing the importance of offline capabilities.

The statement, "I believe that the Final Examination Goal Calculator helps me in preparing for exams," received a mean value of 4.8, suggesting that users find the tool beneficial in their exam preparations. However, the lowest mean score of 4.6 was for the statement, "I believe that the CGPA Calculator helps me in planning my academic goals starting from the beginning of the semester." This indicates a potential area for improvement. Despite the varying mean scores, respondents generally agreed with the statement, "I believe that using these calculators has positively influenced my academic performance," which still reflects a high mean value of 4.77. This indicates that users recognize the overall benefits of the tools in managing their academic progress.

Table 3: The user's perception of the Software Interface Quality for CGPA and Final Examination Goal Calculator

No.	Item	Mean
1	How easy is it to navigate the CGPA Calculator?	4.6
2	How easy is it to navigate the CGPA Calculator?	4.6
3	How easy is it to navigate the Final Examination Calculator?	4.73
4	The organization of information on the calculators' screens were clear.	4.83
5	It was simple and easy to use these calculators.	4.9
6	The interface of these calculators was pleasant.	4.83
7	Overall, I am satisfied with these calculators.	4.93

Table 3 presents the mean scores for the perception of Software Interface Quality for the CGPA and Final Examination Goal calculators. Most respondents agreed with the statement "It was simple and easy to use these calculators," which received a mean score of 4.9. This high score can be attributed to the calculators'

simple input methods, which users are already familiar with during their current semester.

The subsequent statements, “The organization of information on the calculators’ screens was clear” and “The interface of these calculators was pleasant,” both received a mean score of 4.83. This suggests that people agree that the layout and design of the interface improve their overall experience. According to Nielsen's (1994) usability principles, a well-organized interface enhances user comprehension and efficiency, which is reflected in the positive feedback from the respondents. Furthermore, the eco-friendly design that is incorporated within the calculators has improved the overall user experience. When students use these tools for academic planning, they are more likely to be engaged and confident in planning their next action. According to research, a favorable user interface experience is associated with higher academic achievements because students are more likely to use resources that are accessible and easy to manage (Samrgandi, 2021).

In summary, since the mean score for each item is within the range of 4.6 to 5, this shows that the usage of the calculators has been acknowledged and that they are beneficial for students in terms of planning their academic targets.

Comparison between the Existing Application and the Developed Application

This section presents a comparison between our developed calculators and the existing calculator (Haqem, 2024), as shown in Table 4.

Table 4: Comparison between the existing application and the developed application

	Existed Application	**Developed Application**	**Rationale for Improvement**
Functionality	Only calculates the CGPA without predicting the required final examination marks.	Offers both a CGPA calculator and a final examination marks predictor, providing a complete tool for academic planning.	The dual use of the designed calculator allows the students to better monitor their current performance while also planning for their final tests after getting the carry marks.
Mode of Use	Online	Offline	The developed calculators with offline functionality, allowing students to use them without the need for constant internet access.
Data Security & Privacy	There might be a possibility that the data security or privacy is being invaded since the software is online.	Being offline, it offers more privacy since no personal or academic data needs to be shared online.	Using the calculators offline ensures enhanced data security and privacy, as no personal or academic information is transmitted over the internet.
Additional Features	May lack these planning phases and only focus on static CGPA calculations without incorporating predictions based on assessments.	Incorporates academic planning phases (beginning and end of semester) and includes ongoing assessment marks in predictions, making it dynamic.	The developed calculators assist in long-term planning, making it more practical for students who want to adjust their study strategies.

Based on Table 4, the rationale for developing the applications is described, with the main aim being to improve the existing application by adding new features to expand its functionality for long-term planning. In addition, based on the user’s feedback, most respondents agree that having offline tools can significantly enhance user satisfaction and accessibility.

LIMITATIONS OF THE STUDY

Since the developed application primarily focuses on the CGPA calculation and final examination scores, it can be further improved by introducing additional features, such as a course recommender system, where this feature can suggest suitable courses for the upcoming semester. In addition, the application can be improved by having a "Print" button so that the user can save their initial target. There are limitations to the current application, as users need to obtain the software from the developer before downloading it. For future recommendations, these exe files can be linked through any suitable platform, such as UFuture or iCress, for accessibility to all UiTM students.

CONCLUSION

In conclusion, this study successfully develops innovative tools for calculating CGPA and predicting final examination scores, thereby addressing a critical gap in academic planning for students. The CGPA Calculator serves as an essential resource for students at the beginning or middle of the semester, enabling them to effectively plan their GPA and CGPA. As the semester progresses and ongoing assessment marks are finalized, students can shift their focus to the Final Examination Goal Calculator. This tool allows them to estimate the marks required in their final examinations to achieve their desired CGPA. In addition, the user's feedback on usability, user experience, and interface quality of both calculators is considered positive. Future research could explore the integration of additional features or functionalities to further support students in their academic pursuits.

ACKNOWLEDGMENTS

This work was supported by the Universiti Teknologi Malaysia, and Universiti Teknologi MARA.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

AUTHOR CONTRIBUTIONS

Nor Shafiqah Ahmad Jamil: Literature Reviews, Methodology, Results. **Nurhazirah Mohamad Yunos**: Conceptualization, Methodology, Results and Discussions, Limitations of the study, Analysis, Conclusions. **Aishah Mahat**: Introduction, Literature Review. **Ahmad Khudzairi Khalid**: Abstract, Editing, Reference. **Nur Syamilah Arifin**: Editing, Reference, Formatting. **Norbaiti Tukiman.** Proofread.

DECLARATION OF GENERATIVE AI

During the preparation of this work, the authors used ChatGPT to enhance the clarity of the writing. After using ChatGPT, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

DATA AVAILABILITY STATEMENT

Data available on request from the authors.

REFERENCES

Ahmad, J. (2002). *Pemupukan budaya penyelidikan di kalangan guru di sekolah: Satu penilaian* (Doctoral dissertation, Fakulti Pendidikan, Universiti Kebangsaan Malaysia). Retrieved from http://www.pusatsumber.ukm.my/cgi-bin/koha/opac-detail.pl?biblionumber=4264&shelfbrowse_itemnumber=7993

Alazzawi, A., Yas, Q.A., & Rahmatullah, B. (2023). A comprehensive review of software development life cycle methodologies: Pros, cons, and future directions. *Iraqi Journal for Computer Science and Mathematics, 4*(4), 173-190.

Azman, N. S., Rahmatullah, B., Tamrin, K. F., & Qahtan, Y. M. (2024). A preliminary study on tech-based health advisory online system: The case study of UPSI computing students. *AIP Conference Proceedings, 2750*, 040006. https://doi.org/10.1063/5.0148931

Bhushan, M., Vyas, S., Mall, S., & Negi, A. (2023). A comparative study of machine learning and deep learning algorithms for predicting student's academic performance. *International Journal of Systems Assurance Engineering and Management*, *14*, 2674-2683. https://doi.org/10.1007/s13198-023-02160-3

Ezeh, G. N., George, A., Ezeh, E. C., & Inya, C. F. (2012). Micro-controller based cumulative grade point average (MiCGPA) Calculator. *Academic Research International*, *3*(2), 103.

Ghafar, N. A., Rahmatullah, B., Razak, N. A., Muttallib, F. H. A., Adnan, M. H. M., & Sarah, L. L. (2023). Systematic literature review on digital courseware usage in Geography subjects for secondary school students. *Journal of ICT in Education, 10*(1), 26-39. https://doi.org/10.37134/jictie.vol10.1.3.2023

Hashim, J. (2012). Academic excellence as selection criteria among Malaysian employers. *Higher Education Skills and Work-based Learning*, 2(1), 63–73. https://doi.org/10.1108/20423891211197758

Haqem, (2024, September 11). *CGPA Calculator Universiti Teknologi MARA.* https://haqem.com/cgpa/cgpa-calc-uitm/

Hussain, A., Rehman, S. U., & Hussain, I. (2014). Effect of grading policy on Students' CGPA− A case study of an engineering college. *International Journal of Engineering Research and Development*, *10*(7), 01–09.

Jewel, M. R., Uddin, M. R., Islam, M. M., Asadushjaman, M., & Ahmed, K. T. (2017). An Android app for university management system. *IOSR Journal of Mobile Computing & Application*, *4*(1), 15–20. https://doi.org/10.9790/0050-04011520

Nielsen, J. (1994). *Usability engineering*. Morgan Kaufmann.

Nor Adibah, A. H., Nurhafizah, A. & Noor, A. A. R. (2017). Factors that significantly affect college students' CGPA. International *Academic Research Journal of Social Science*, 77-81.

Nurudeen, A. H., Fakhrou, A., Lawal, N., & Ghareeb, S. (2023). Academic performance of engineering students: A predictive validity study of first-year GPA and final-year CGPA. *Engineering Reports*. https://doi.org/10.1002/eng2.12766

Omotosho, O. J. (2013). Assessment of students' performance: grading systems. *Information and Knowledge Management*, *3*(2), 26–50. https://www.iiste.org/Journals/index.php/IKM/article/download/4281/4349

Ramadhianti, R. H., & Soegoto, D. S. (2024). The role of scholarships on learning motivation. *Proceeding of International Conference on Business, Economics, Social Sciences, and Humanities*, *7*, 252-258. https://doi.org/10.34010/icobest.v7i.534

Rahiem, M. (2020). Technological barriers and challenges in the use of ICT during the COVID-19 emergency remote learning. *Universal Journal of Educational Research, 8*(11B), 6124–6133. https://doi.org/10.13189/ujer.2020.082248

Samrgandi, N. (2021). User interface design & evaluation of mobile applications. *International Journal of Computer Science & Network Security, 21*(1), 55-63.

Sarah, A. M., Rabbi, M. I. H., Siddiqua, M. S., Banik, S., & Hasan, M. (2020). Prediction of cumulative grade point average: A case study. In K. Arai (Ed.), *Intelligent computing: Proceedings of the 2020 Computing Conference* (Vol. 2, pp. 33–42). Springer International Publishing. https://doi.org/10.1007/978-3-030-52246-9_3

Sauro, J., & Lewis, J. R. (2016). *Quantifying the user experience: Practical statistics for user research* (2nd ed.). Morgan Kaufmann.

Sudin, I. A. A., Rahmatullah, B., Abdullah, M. F. W., Tamrin, K. F., Khairudin, M., & Yahya, S. R. (2022). Kajian tinjauan literatur sistematik terhadap pendedahan pelajar universiti kepada percetakan 3D sebagai persediaan ke industri. *Journal of ICT in Education, 9*(1), 48–60. https://doi.org/10.37134/jictie.vol9.1.5.2022

Universiti Teknologi MARA (UiTM). (2011). *UiTM academic regulations (Amendment 2011): CGPA* (p. 25).

Umar, M. A., Shuru, A., Kufena, A. M., Tanko, M. Y., Sambo, A. A., & Hassan, S. A. (2018). Mobile CGPA monitoring system: A tool to guide self-directed learning. In J. M. Giuseffi (Ed.), *Emerging self-directed learning strategies in the digital age* (pp. 10–21). IGI Global. https://doi.org/10.4018/978-1-5225-3465-5.ch002

Yogendra, N., & Andrew, A. (2017). A study on the factors influencing on grade point average (GPA) with special reference to third year commerce and management students of Eastern University, Sri Lanka. *Journal for Studies in Management and Planning*, *3*(8), 409–425.

Zamzuri, M. S. M., Rahmatullah, B., Purnama, S., & Dheyab, O. A. (2024). Development of food sharing IT platform for university community. *AIP Conference Proceedings, 2750*, 060002. https://doi.org/10.1063/5.0148929

Zukriyani, F. a. M., & Azizan, N. (2023). Student academic planner system: A review. *Malaysian Journal of Science Health & Technology*, *9*(1), 63–73. https://doi.org/10.33102/mjosht.v9i1.32