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# Pointer Calculator: Integrating Web Based in Calculating GPA and CGPA

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## ABSTRACT

Grade Point Average (GPA) is the student's average grade attained in each course for a specified semester, and Cumulative Grade Point Average (CGPA) is the average result from all the semesters taken. Both GPA and CGPA are indicators of students' academic achievement. Though grading systems vary depending on countries or schools, GPA and CGPA are widely adopted systems for assessing students' academic achievement at various levels of education in higher education institutions. Although the system is widely used, SPM leavers find it hard to understand the calculation leading to the GPA and CGPA values obtained. Therefore, this study took the initiative to provide exposure to the students with the development of GPA and CGPA calculators. Using this pre-built calculator, students only need to enter the grade for each subject they are taking. The advantage of this calculator is that students can see the working route for the GPA and CGPA computations, which they can also print. Academic mentors are permitted to receive data for monitoring reasons from the department. Students only need to download and utilize the applications for free.

**Keywords:** GPA; CGPA; calculator; academic performance; pointer

## INTRODUCTION

There are a variety of undergraduate study options offered for SPM leavers in higher education institutions, such as foundation studies, STPM, and diplomas, which they can then pursue into degrees and master's degrees. The most common grading systems used in colleges and universities are grade point average (GPA) and cumulative grade point average (CGPA). The CGPA scale is diverse in terms of marks distribution, with some universities following USA standards but not similar. Researchers have discussed the application of the scale of CGPA, which is set by the government and the Ministry of Education. This benchmark is mandatory for educational institutions, educational boards, and universities, as it is set by the government and the Ministry of Education <sup>[1]</sup>. A tool is needed to monitor a student's courses and project scenarios that will allow them to clear a particular academic level or clear academic probation. This tool will greatly ease up the adviser's job and minimize, if not eliminate, advising errors. It will also be of great help to any academic institution implementing the GPA system <sup>[2]</sup>.

Locally practiced, GPA and CGPA is a numeric depictions of students' academic performance in the tertiary education system. GPA calculates the average grade for a specific semester, while CGPA calculates the overall average of students' academic performance for all semesters until graduation. Ranging from a scale of 1.0 to 4.0, both GPA and CGPA track the

student's progress during their studies and are often used as an indicator in producing competent graduates. Each university subject is assessed on a 100 (or 4) point scale in the exam, with 100 (or 4) being the highest and 0 being the lowest possible score. Since the aggregate would thus range from 75 to 100 (3 to 4), it should be noted that the higher the academic achievement, the lower the aggregate <sup>[3]</sup>. According to Adibah et al., there are a few factors that affect the CGPA results such as the teaching and learning process, self-motivation, and attitude of students toward the course <sup>[4]</sup>.

In general, calculating the overall average of students' academic performance is vital in encouraging self-development during the tenure years in college or university. It was found that academic achievement has a significant impact on a student's motivation, persistence, and sense of self-worth in higher education <sup>[5]</sup>. By setting a goal, students can monitor their progress as well as plan future required improvements, which helps them to visualize their learning path and build a focused mindset for their studies.

However, when SPM leavers further study with foundation, STPM, or diploma programs, they have no knowledge of how GPA nor CGPA are calculated, making it difficult for them to set a goal to achieve good exam results. Most of the time, briefing and explanation were provided by institutions via traditional PowerPoint or spreadsheet, which proved ineffective as most students still struggled to understand the computations, or they simply forget how the calculation works after the briefing is over. Other than that, students also tend to misplace or lost the document provided after some time.

As a result, this study took the initiative to provide students with exposure through the development of GPA and CGPA calculators. When utilizing this pre-built calculator, students simply enter their grades for each subject they are studying for that semester. With a single click, the results will be displayed immediately. These eliminate the issue arising from lost documents provided by the institutions on how to calculate GPA or CGPA.

Even after entering tertiary education, students still need supervision and counsel from someone skilled and experienced in their field of study <sup>[6]</sup>. Academic advising applies knowledge of the field to empower students and campus and community members to successfully navigate academic interactions related to higher education <sup>[7]</sup>. Hence, most institutions developed a student-advisor relationship, called as academic advisors or mentors, with a distinct role to aid students in achieving educational, career, and personal goals. With access to data from this built-in calculator, academic mentors will have a piece of mind to generate ideas on how to help their mentees based on their strong and weak subjects to achieve their targeted goals.

## INNOVATION DEVELOPMENT

The developer of this invention requires knowledge of computer programming namely Construct 3. Construct 3 is an HTML5 game engine based on a 2D and 3D game engine created by Scirra Ltd. Using Construct 3, this research creates a pointer calculator.

The main setup of the web page consists of three tabs; structure, calculator and result, as shown in Figure 1.



**Figure 1:** Main page of the app

By clicking *struktur* tab, a set list of each subject offered with its credit hour for each semester can be viewed (Figure 2). Each page showed subjects from a different category of STEM courses offered. Students can return to the main page simply by clicking the back arrow button on the top left of the page. On this page, students are able to track each subject they have taken or need to be taken in the semesters to come.



**Figure 2:** Subject offered in one of the category

In the *kalkulator* tab, several simple pieces of information need to be filled in by students (Figure 3) such as Matrix Number, the semester they are in, and their program category, in which once students filled in the required information, the subjects offered and its credit hour are automatically listed, ready for the students to fill in their grade for each subject. The GPA will then be automatically calculated each time the grade for each subject has been chosen from the drop-down button (Figure 4).



Figure 3: Front page in *kalkulator* tab

Nama Kursus	Gred	Jam Kredit	Mata Nilaian	Jumlah Mata Nilaian Gred
Biologi I	A-	5	3.75	18.75
Science in Life I	B+	5	3.5	17.5
Kimia I	C	5	2.0	10
Matematik I	C	3	2.0	6
English for Special I	A-	3	3.75	11.25
Hafazan Al-Quran E	A	1	4	4
<b>Matrik : A1672</b>		<b>Jumlah Timbunan Mata Nilaian Gred:</b>		<b>67.5</b>
<b>Semester : 1</b>		<b>Purata Nilaian Gred (PNG):</b>		<b>3.07</b>

Figure 4: The generated GPA

As the result for each semester is filled, students can view the CGPA achieved in the *keputusan* tab as shown in Figure 5. Students would have the option to print their results as a reference simply by clicking the print icon on the bottom right.

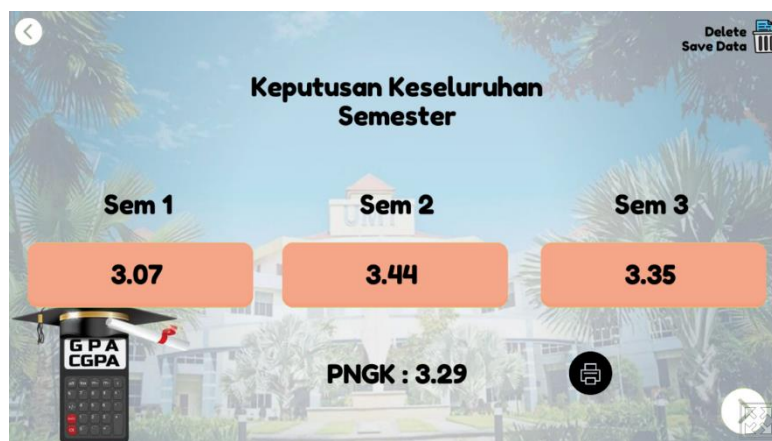


Figure 5: Front page of *keputusan* tab

Most higher education institutions now adopt the concept of the lecturer as an academic mentor, in which each lecturer is entrusted to help their mentee with academic and as well as non-academic related issues. The novelty of this project is by using this pointer calculator, the mentor will be able to quickly gain access to their mentees' GPA and CGPA (Figure 6), including the subjects taken or to be taken by the mentee throughout the program.

	A	B	C	D	E	F	G	H	I	J	K	L	
1	Nama	Sem	CGPA	Kategori (A,BB,BF,BK)	Semester 1								Semester 2
2				A=Biasa , BB=TanpaBio , BF=TanpaFizik , BK=TanpaKimia	Biologi I	Fizik I	Kimia I	Matematik I	English for Special Purposes	Hafazan Al-Quran Bertajwid I	Science in Life I	Biologi II	
3	A0167	1	3.95	A	A	A	A	A-	A	A-			
4	A0167	1	3.95	A	A	A	A	A-	A	A-			
5	A0167	2	3.14	A								A	
6	A0167	1	3.56	A	A	B	A-	B-	A	C-			
7	A0167	3	3.85	A									
8	A0167	2	3.9	A								A	
9	A0167	1	3.89	A	A-	A	A-	A	A	A			
10	A0167	1	3.95	BB		A	A	A-	A	A-	A		
11	A0167	3	3.85	BK									
12	A0167	1	3.88	BB		A	A-	A-	A-	A	A		
13	A0167	2	3.33	BB									
14		1	0	A									
15	A1088	1	3.68	A	B	A	A-	A-	B	B			
16	A2430	2	4	BK								A	
17	A1704	2	3.75	A								A	

**Figure 6:** Mentor’s viewing page

These data will be a big help to the mentor to quickly monitor, advise and suggest ways to help their mentee which may include managing time appropriately, study plan, or appropriate study skills. Other than that, the data gained can also help the mentor to detect any issues that might arise for each mentee related to their major or program, especially for any subject that requires pre-requisite.

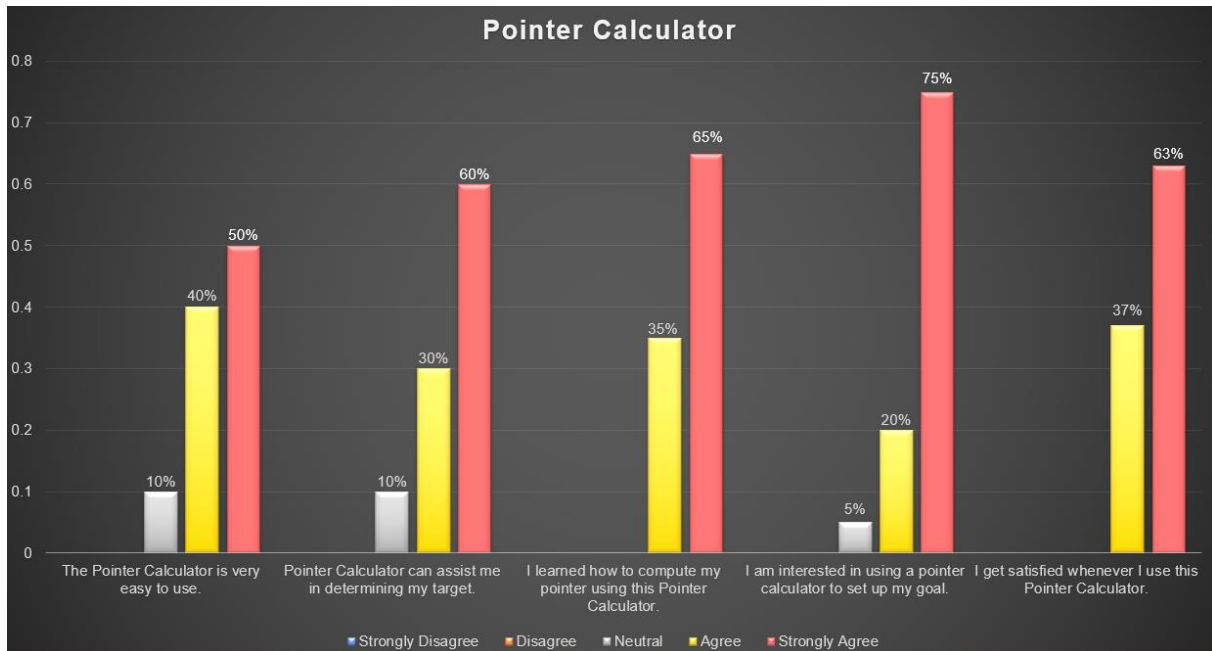
## COMMERCIAL POTENTIAL

Previously, students were provided documents in Word, spreadsheet, or PowerPoint format to fill out their target GPA and CGPA. They learn to calculate their pointer with this form as well. Because of this strategy, students have a major risk that the document will be misplaced or lost. Nowadays, all students are in flow with the trends in technological innovation due to their fast interactivity with electronic devices. The internet has dramatically revolutionized and expanded the feasibility of various web or mobile applications.

We integrated paper into web page with the aim of using technology so that students at any level of education and at any time can use a pointer calculator to compute their GPA and CGPA for free. Regardless of any institution, program, or education level pointer calculator can be used to setup their program structure with the details of credit hours in the setting button provided as shown in Figure 1.

The usage of the pointer calculator may benefit the market potential of both end-users, educators, and students as it could save time and cost, be well organised, and be environmentally safe. In addition, the data history of grade calculation can be retrieved as it is kept in the system. Hence, the student’s academic performance can be periodically monitored by the advisors throughout the semesters. At the same time, the data of the CGPA calculation can be displayed to the student so that they can acknowledge their strengths and weaknesses for better grade improvement.

A survey has been conducted to assess the user's experience with this pointer calculator, as shown in Figure 7. The majority (>50%) of users agree and strongly agree that the pointer calculator is extremely easy to use, that it assists them in determining their target, that they learn how to compute the pointer, that they are interested in using it to set up their goal, and that they are satisfied whenever they use it.



**Figure 7:** A survey of users' experiences with the pointer calculator

The copyright of this invention has been applied in May 2023 via the Intellectual Property Corporation of Malaysia (MyIPO) as shown in Figure 8.



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YBrs. Prof./Prof.Madya Dr./Dr./Tuan/Puan,

### MAKLUMAT STATUS PENDAFTARAN HARTA INTELEK BAGI BILANGAN 2/2023

Dengan segala hormatnya perkara di atas dirujuk.

2. Sukacita dimaklumkan bahawa status permohonan pendaftaran harta intelek telah **diterima** dan dalam proses kelulusan serta pendaftaran dari pihak Pusat Inovasi dan Pengkomersialan (ICC).

3. Maklumat lanjut permohonan yang diterima adalah seperti berikut :

**Tajuk Permohonan** : Pointer Calculator : Integrating App in Calculating GPA and CGPA

**Inventor** : 1. Nurul Syahida Abu Bakar (Ketua)

**Jenis Harta Intelek** : Hak Milik/ *Copyright*

4. Untuk Makluman, proses pendaftaran dan status terkini akan dimaklumkan dalam masa terdekat. Semoga perkara ini berada dalam makluman dan perhatian YBrs. Prof./Prof.Madya Dr./Dr./Tuan/Puan.

**Figure 8:** Application of copyright

## EQUATION

The following expression has been used to calculate GPA and CGPA in the pointer calculator.

$$\text{Semester GPA} = \frac{\sum(\text{Course credits} \times \text{Grade points obtained}) \text{ of a Semester}}{\sum(\text{Course credits}) \text{ of respective Semester}}$$

$$\text{Semester CGPA} = \frac{\sum(\text{Total credits of a Semester} \times \text{GPA of respective Semester}) \text{ of all Semesters}}{\sum(\text{Total course credits}) \text{ of all Semesters}}$$

## CONCLUSION

The goal of the pointer calculator is to guide SPM leavers on how to compute and set their target GPA and CGPA. Users just enter their grades for each subject they are taking when utilizing this technology. The calculator will assist students in quickly calculating their GPA and CGPA. The computation is clearly displayed in the print function so that the user understands how the GPA and CGPA are obtained. Nonetheless, academic mentors are permitted to receive data from the pointer calculator that students update. The purpose is for the mentor to keep track of their mentee's performance as well as their GPA and CGPA target. Since the pointer calculator is user-friendly, it can be used by any institution, education level, or program at any time. It would be a tremendous success if the calculator could be widely linked to different universities' LMS at any time.

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