Comparing the Weighted Average and Grade Point Average Grading Systems, a Case of Universities in Ghana

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Abstract
Universities in Ghana have over the years been at variance with each other on the grading systems to use in assessing students. Whiles some follow the American's Cumulative Grade Point Average (CGPA) system, others use the British's Cumulative Weighted Average (CWA) system. This work presents the versions of the two systems as used by most universities in Ghana and compares them under different factors. The study puts the WA system above the GPA system in terms of flexibility in computation, fairness in grading, and it is comparatively easier for students to obtain better grades and certificates. We have also proposed possible means of closing the gap between the two systems particularly in terms fairness and rewards to hardwork by students. This is particularly important if the universities in Ghana will continue to use different grading systems so as to give a fair comparison of their products at the job market.

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1. Introduction

Grading system used by a university plays a very important role in assessment process of university. University grading system is therefore very important in determining the certificates awarded to students upon completion. There are two main grading systems adopted by the universities in Ghana, the Weighted Average (WA) and the Grade Point Average (GPA) systems.

However, grading system used by universities in several countries are unique and usually seen to be owned by such countries.

1.1 Countries and Grading System

In Germany a five (5) point grading scale is used at universities to evaluate students. The scale goes from 1 (sehr gut [very good]) to 6 (ungenügend [insufficient]). The grades "5" and "6" are considered as failing grades[4]. The smaller the grade, the better .

In China, for most of the universities and colleges, and most of the high schools, the grading system is divided into five categories from a pass mark of 60% to 100% [7]. The Peking University, China uses a grade point average system which assigns to a pass mark (in percentage) a specific grade point using the formula

$$GP = \begin{cases} 4 - \dfrac{3}{1600} \times (100 - x)^2 & 60 \leq x \leq 100 \\ 0 & 0 \leq x < 60 \end{cases}$$

[7]. The use of this formula makes the grading system a very fair system, because no two different marks (in percentage) have the same grade point.

Universities in The Netherlands on the other hand rates students performance out of ten (10) and the bigger the point the better. The universities in France use a twenty point grading system and in this system too, the bigger the grade the better. Academic work in the United States of America (USA) is graded A-F. The numeric scale associated to these grades (4-0) is used to calculate the grade

point average (GPA) of your entire qualification [3]. Just like in the case of The Netherlands, the bigger the grade the better.

The United Kingdom marks students out of 100 and uses the same mark in computing the CWA of the students. In the case of Ghana, universities producing into the same Ghana job market and regulated by the same regulatory bodies (National Accreditation Board (NAD) and National Council for Tertiary Education (NCTE)) different grading systems are used. It therefore becomes very difficult for industry to compare performances of graduates coming from two universities using different grading system.

In the rest of the work we presents detailed information about the two grading systems, WA and GPA, compare the two using different criteria and then present in each case a possible solution.

2. The Weighted Average (WA) System

The Weighted Average (WA) system used in Ghana uses the marks obtained in the assessment process usually marked out of 100% for the computation. Each course is weighted by *credit hours* as approved by the academic body of the university. The credit hours of each course is also used by the system in computing the average used in classifying the students' performance.

2.1 Examination and Assessment

The assessment process is made up of two parts an end-of-semester examination conducted at the end of each semester and a continuous assessment (CA) which comprises mid-semester examination, tutorials, quizzes, report, take home assignment, seminars etc conducted within the semester. The end-of-semester examination is weighted 70% and the continuous assessment 30% of the total marks of the course [1]. Students are allowed to resit for all failed examinations at a later date.

After a resit examination, the marks obtained are treated like marks obtained from additional courses taken in the semester with the corresponding credits [1]. Examinations in all course are credited by marks (out of 100%) and later graded as in TABLE 1;

Table 1. *Examination Grades in CWA system*

Marks	Grade	Interpretation
70 - 100%	A	Excellent
60 - 69.99%	B	Very Good
50 - 59.99%	C	Good
40 - 49.99%	D	Pass
0 - 39.99%	F	Fail

2.2 Computation of CWA

The following steps are used in computing the Cumulative Weighted Average (CWA)

1. Multiply the percentage mark scored in each course by the credit hours of the course to obtain the **Weighted Mark**

2. Add up all the weighted marks calculated up to the end of the semester in question to obtain **Cumulative Weighted Mark (CWM)**

3. Add up the credit hours of all corresponding courses up to the end of the semester in question to obtain the **Cumulative Credits**

4. Calculate the Cumulative Weighted Average (CWA) up to the end of the semester in question as follows

$$CWA = \frac{\text{Cumulative Weighted Mark (CWM)}}{\text{Cumulative Credits}}$$

[1]

The following is an illustration of the computation of CWA of a student who have taken three semesters of course works;

First Semester

Course	Credit	% Mark	Weighted Mark (WMK)
SNAR 151	3	58	3 × 58=174
SNAR 153	3	51	153
SNAR 155	2	35	70
SNAR 157	2	42	84
SNAR 159	3	30	90
	13		**571**

$$\begin{aligned}
\text{Weighted Marks (WM)} &= 571 \\
\text{Semester Credits} &= 13 \\
\text{Weighted Average (WA)} &= \frac{571}{13} \\
&= 43.92
\end{aligned}$$

Second Semester

Course	Credit	% Mark	Weighted Mark (WMK)
SNAR 152	3	75	225
SNAR 154	3	54	162
SNAR 156	4	67	268
SNAR 160	3	40	120
	13		**775**
	Semester Average		**59.61**

$$\begin{aligned}
\text{CWM (end of 2nd Sem.)} &= 571 + 775 \\
\text{Cumulative Credits} &= 13 + 13 \\
\text{CWA (end of 2nd Semester)} &= \frac{(571+775)}{(13+13)} \\
&= \frac{1346}{26} \\
&= 51.76
\end{aligned}$$

Third Semester (First Semester in Second Year)
Note that the following Courses have been failed in the

previous first semester: ARC 155 and ARC 159

Course	Credit	% Mark	Weighted Mark (WMK)
SNAR 155	2	42	84
SNAR 159	3	58	174
SNAR 201	3	65	195
SNAR 203	4	59	236
	12		**689**
		Average	**57.41**

$$
\begin{aligned}
\text{CWM (end of 3rd Sem.)} &= 571 + 775 + 689 \\
\text{Cumulative Credits} &= 13 + 13 + 12 \\
\text{CWA (end of 3rd Sem.)} &= \frac{(571 + 775 + 689)}{(13 + 13 + 12)} \\
&= \frac{2035}{38} \\
&= \mathbf{53.55}
\end{aligned}
$$

It can be noted from the computation above that for the course SNAR 155, and SNAR 159, the details of both the failed attempt in the first semester and the passed attempt in the third semester were used. Even though the student in question had retaken these course and passed, the current CWA of **53.55** is as a result of the contribution from even the failed attempts of SNAR 155, and SNAR 159. If the credit hours of these two courses were used without their corresponding marks, the CWA would have reduced to **49.34**. On the other hand, if both the credit hours and the marks of the failed attempts were not used, the CWA would rather increase to **56.81**.

2.3 Graduation Classification

The graduation classification as pertained in the WA system are based on the final CWA and are as shown in TABLE 2

Table 2. *Graduation Classification in CWA system*

final CWA	Classification
70 or above	First Class
60 - 69.99	Second Class (Upper)
50 - 59.99	Second Class (Lower)
45 - 49.99	Pass
0 - 44.99	No Certificate

3. The Grade Point Average (GPA) System

The Grade Point Average (GPA) system comes in several forms. It assigns to ranges of percentage marks obtained or alphabetical grades a value called the grade point. These grade points are usually taken out of four (4). In some cases out of five (5), out of ten (10) e.t.c. These points are used to compute the CGPA used in determining the graduation class of the students.

3.1 Examination and Assessment

The assessment process in GPA system like the CA system is in two parts, an end-of-semester examination conducted at the end of each semester and a continuous assessment (CA) which comprises mid-semester examination, tutorials, quizzes, report, take home assignment, seminars etc conducted within the semester. The only difference in assessment is that the end-of-semester examination is weighted 60% and the continuous assessment 40% of the total marks of the course.

A student may decide to re-register for a failed course on a future occasion. If he/she resits and passes the examination, he/she shall be awarded the full grade earned on the occasion. However, in determining the FGPA, a weighted average of all resit courses shall be used [2]. That is, marks obtained from resit examination are treated like marks obtained from additional courses taken in the semester with the corresponding credits. TABLE 3 shows the various ranges or grades with their corresponding grade points.

Table 3. *Examination Grades in GPA system*

Grade	Mark %	Interpretation	Grade Point
A	80-100	Excellent	4.00
B+	75-79	Very Good	3.50
B	70-74	Good	3.00
C+	65-69	Fairly Good	2.50
C	60-64	Average	2.00
D+	55-59	Below Average	1.50
D	50-54	Marginal Pass	1.00
E	45-49	Below Marginal pass	0.50
F	0-44	Fail	0

3.2 Computation of CGPA

The cumulative grade point average is calculated by dividing the grade point obtained, up to any specific time, by the total credit of all courses for which the student has registered up to that time. We outline the following steps for its computation.

1. Multiply the grade point corresponding to the percentage mark scored in each course by the credit hours of the course to obtain the **Weighted Grade Point (WGP)**

2. Add up all the weighted marks calculated up to the end of the semester in question to obtain **Cumulative Grade Point (CWP)**

3. Add up the credit hours of all corresponding courses up to the end of the semester in question to obtain the **Cumulative Credits**

4. Calculate the Cumulative Grade Point Average (CGPA) up to the end of the semester in question

as follows

$$CGPA = \frac{\text{Cumulative Grade Point (WGP)}}{\text{Cumulative Credits}}$$

We present the computation of CGPA of a student who has taken three semesters of course work in the following illustration,

First Semester

Course	Credit (A)	Student Grade	Grade point (B)	Grade point earned (A×B)
MATH 101	3	85	4.00	12.00
MATH 103	2	60	2.00	4.00
MATH 105	3	72	3.00	9.00
MATH 107	3	40	0.00	0.00
	11			25.00

Weighted Grade Points	=	25.00
Semester Credits	=	11
WA of 1st Semester	=	$\frac{25}{11} = $ **2.27**

Second Semester

Course	Credit (A)	Student Grade	Grade point (B)	Grade point earned (A)×(B)
MATH 102	3	92	4.00	12.00
MATH 104	3	78	3.50	10.50
MATH 106	2	81	4.00	8.00
	8			30.50

CGP (end of 2nd Semester)	=	25.00 + 30.50
Cumulative Credits	=	11 + 8
CGPA (end of 2nd Semester)	=	$\frac{(25.00 + 30.50)}{(10 + 8)}$
	=	$\frac{57.50}{19} = $ **3.02**

Third Semester

MATH 107 was failed in the first semester

Course	Credit (A)	Student Grade	Grade point (B)	Grade point earned (A)×(B)
MATH 107	3	65	2.50	7.50
MATH 201	3	78	3.50	10.50
MATH 203	2	81	4.00	8.00
	8			27.00

CGP (end of 3rd Semester)	=	25.00 + 30.50 + 27.00
Cumulative Credits	=	11 + 8 + 8
CGPA (end of 3rd Semester)	=	$\frac{(25.00 + 30.50 + 27)}{(10 + 8 + 8)}$
	=	$\frac{82.50}{27} = $ **3.05**

In this system, even though both the credit hours and grade point of the failed attempt of MATH 107 are used, the contribution to the GPA is zero. Unlike the WA system, the student in this system has no benefit from the 40% mark he/she obtained in MATH 107. If the credit hours for MATH 107 in the failed attempt is also set to zero as its Grade Ponit, the CGPA will increase to **3.43**.

3.3 Graduation Classification

The classification of the bachelor's degree is based on the computed Final Grade Point Average FGPA. These classifications are as shown in TABLE 4:

Table 4. *Graduation Classification in GPA system*

Final GPA	Classification
3.60 or better	First Class
3.00 - 3.59	Second Class (Upper)
2.00 - 2.99	Second Class (Lower)
1.50 - 1.99	Third Class
1.00 - 1.49	Pass
below 1.00	No Certificate

4. Comparison and Discussion

A careful study of the two systems as described above reveals the following observations;

4.1 Rewards to high Score

CWA system rewards high score in grade ranges whereas in GPA, high marks are of no use. TABLE 5 shows two students in each system scoring the same grades. The two students in GPA system get the same CGPA and for that matter the same classification in certificate but in the CWA system, the student who scored high marks in the grades gets a better classification.

In other words the CWA grading system allows compensating ones poor performance in one course with the excellent performance in another. The computation in

Table 5. *CWA system rewards high scores*

CWA System				CGPA System				
Student1				**Student1**				
Course	Credit	Marks	Grade	Course	Credit	Marks	Grade	Grade Point
Course1	2	50	C	Course1	2	50	D	1
Course2	3	93	A	Course2	3	93	A	4
$\text{CWA} = \dfrac{2 \times 50 + 3 \times 93}{5} = 75.8$				$\text{CGPA} = \dfrac{2 \times 1 + 3 \times 4}{5} = 2.8$				
Student2				**Student2**				
Course	Credit	Marks	Grade	Course	Credit	Marks	Grade	Grade Point
Course1	2	50	C	Course1	2	50	D	1
Course2	3	80	A	Course2	3	80	A	4
$\text{CWA} = \dfrac{2 \times 50 + 3 \times 80}{5} = 68$				$\text{CGPA} = \dfrac{2 \times 1 + 3 \times 4}{5} = 2.8$				

TABLE 5 means that *Student1* in the CWA system had an excess of $23 \times 3 = 69$ points from course2. The 69 points has a mark value of $69/2 = 34.5$ when it is taken to *Course1* which give *Course1* a mark of $50 + 34.5 = 84.5$. This means that indirectly or on the average, Student1 scored a grade of A in both course. But in the GPA system *Student1* has no benefit for his/her extra $13 \times 3 = 39$ points.

According to Vice Chancellor of University of Ghana, the GPA system is hurting the educational system. Because for them it doesn't really reward people for what they stood for[5][6]. This problem of the GPA system is reduced if marks below the pass mark of 45% as well as marks above 80% are grouped and graded. This grading could be as follows 85 - 89.99 = 4.4, 90 - 95 = 4.7 and 95 - 100 = 5. Similar grades below 0.5 could be assigned to marks below 45% or a new system could be fashioned out that uses smaller group sizes and distributes the highest grade of 4 or 5 uniformly from 0% to 100%.

4.2 Difficulty level

It is more difficult to earn good mark in the GPA system than in the CWA system. To illustrate this, let us compare two very brilliant students who have obtained all marks for the continuous assessment (CA) in their respective systems. The student in the CWA system has CA of 30/30 and the one in GPA has 40/40. Even though for each of the students to get grade A, they both need an actual mark of 40 to get 70 and 80 respectively, it is very difficult for the one in the GPA system to get the grade A than the one in the CWA. This is because the student in CWA will be fighting for 40 out of 70 which means he/she needs $40/70 \times 100 = 57.1429\%$ of the final examination mark whereas the one in the GPA system needs $40/60 \times 100 = 66.6667\%$ of the final examination mark.

But in general the GPA system is better than the CWA system if the student in the GPA system after obtaining a CA of 40/40 seeks for a pass mark of 45% to 69% whiles the one in the CWA system seeks for pass mark of 40% to 64%. The difficulty levels are the same when the students wants 70% and 65% respectively in GPA and CWA. But beyond 70% and 65% respectively, the GPA system becomes more difficult than than the CWA system. See the table in appendix A

For instance, if the students need just a pass, then it is easier for the one in the GPA system to get the weak pass of 45% (he will need $5/60 \times 100 = 8.33\%$) than the students in the CWA system to get the weak pass of 40% (he/she will need $10/70 \times 100 = 14.29\%$).

In the worse case of both students scoring zero(0) in CA, the student in the CWA system needs $40/70 \times 100 = 57.1429\%$ of the examination mark to pass since pass mark is 40% whereas the student in GPA system needs $45/60 \times 100 = 75\%$ of the final examination mark to pass since the pass mark is 45%

This difference in levels of difficulty can be bridged by undertaking the following changes in the GPA system;

1. reduce the continuous assessment to 30% as in WA system.

2. reduce the pass mark to 40% as in WA system.

3. set the least mark for grade A to 70% as in WA system.

Similarly, this could be achieved by increasing the corresponding marks in the WA system to those of the GPA system.

4.3 Fairness to Students who Fail Examination

Since in both systems, the credit and grade point or marks obtained in failed examinations are used in the computation of CGPA and CWA respectively, the GPA system unfairly cheats students who fail in examination. This is

because the GPA system awards a grade of zero (0) to failed examination and as such the marks obtained in such examination contributes nothing to the final classification. That is the student have no benefit from his/her hard earned marks no matter how small it may be. But in the CWA system, the whole mark is used whether failed or not making the mark obtained in the failed attempt beneficial.

Using the credit hours of the failed attempts in computing the GPA means, the student benefits from only half of his/her pass grade if he passes on the second attempt, one third if on the third attempt, one fourth on the fourth attempt and so on whereas in the CWA system, the students gets the full benefit of the marks obtained.

Loosing of part of the pass grade by students who fail in the GPA system can be prevented by replacing the details of the failed attempt with the those of the pass attempt. Opoku and Ankamah in [5] showed that more than twenty students of the 628 students who graduated from University of Energy and Natural Resources, Sunyani in 2017 would have had a graduation classification better than what they had if the university had adopted the idea of replacing details of failed attempts with those of the passed attempt. What this idea means is that, since the grade of fail is set to zero (0), the credit should also be set to zero so that failed attempts have no effect on the computation of the CGPA.

This idea of replacing details of failed examination is very important, since it reduces the pressure on students to pass examination at all cost in their first attempt even when they know preparation towards the particular examination is not good enough.

The fear of being punished severely in the GPA computation when one fails in examinations causes some students to indulge in foul means to passing examinations which is evident in the examination malpractice case in some universities in Ghana. If this policy is implemented, students who fail may spend some time to prepare well to pass the examination fairly in another period which may cause a reduction in examination malpractice.

5. Conclusion

The WA system is more flexible in computation. It is very easy to get a better classification in CWA system than in CGPA system. Whiles the CWA system allows compensating ones poor performance in one course with a good performance in another, the GPA system does not. The GPA system rather demands that a student is consistent in performance in all courses since a high mark in one course cannot compensate for a low mark in the other. We have proposed possible solution to this unfair treatment by the GPA system.

We have also presented a solution to the unfair treatment by GPA system to student who fail, where no reward is given to the whatever mark they obtained in such attempts.

Universities in Ghana must be uniform in the system used to assess students performance. We recommend the use of one grading system by all universities in Ghana, it could be one of the two discussed or a newly fashioned system that will be unique to universities in Ghana. This will make it very easy for industry and graduate schools to compare students coming from different universities. We also recommend the abolishing of the use of the results of failed courses to grade students even after the students passed the course later. This is not a practise in Britain and The USA where the grading systems where borrowed from.

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Table 6. Percentage of Examination marks Needed

GPA			CWA		
Total Mark Needed	Difference between CA (40) and total	Percentage of Exams needed	Total Mark Needed	Difference between CA (40) and total	Percentage of Exams needed
45	5	8.33	40	10	14.29
46	6	10.00	41	11	15.71
47	7	11.67	42	12	17.14
48	8	13.33	43	13	18.57
49	9	15.00	44	14	20.00
50	10	16.67	45	15	21.43
51	11	18.33	46	16	22.86
52	12	20.00	47	17	24.29
53	13	21.67	48	18	25.71
54	14	23.33	49	19	27.14
55	15	25.00	50	20	28.57
56	16	26.67	51	21	30.00
57	17	28.33	52	22	31.43
58	18	30.00	53	23	32.86
59	19	31.67	54	24	34.29
60	20	33.33	55	25	35.71
61	21	35.00	56	26	37.14
62	22	36.67	57	27	38.57
63	23	38.33	58	28	40.00
64	24	40.00	59	29	41.43
65	25	41.67	60	30	42.86
66	26	43.33	61	31	44.29
67	27	45.00	62	32	45.71
68	28	46.67	63	33	47.14
69	29	48.33	64	34	48.57
70	**30**	**50.00**	**65**	**35**	**50.00**
71	31	51.67	66	36	51.43
72	32	53.33	67	37	52.86
73	33	55.00	68	38	54.29
74	34	56.67	69	39	55.71
75	35	58.33	70	40	57.14
76	36	60.00	71	41	58.57
77	37	61.67	72	42	60.00
78	38	63.33	73	43	61.43
79	39	65.00	74	44	62.86
80	40	66.67	75	45	64.29
81	41	68.33	76	46	65.71
82	42	70.00	77	47	67.14
83	43	71.67	78	48	68.57
84	44	73.33	79	49	70.00
85	45	75.00	80	50	71.43
86	46	76.67	81	51	72.86
87	47	78.33	82	52	74.29
88	48	80.00	83	53	75.71
89	49	81.67	84	54	77.14
90	50	83.33	85	55	78.57
91	51	85.00	86	56	80.00
92	52	86.67	87	57	81.43
93	53	88.33	88	58	82.86
94	54	90.00	89	59	84.29
95	55	91.67	90	60	85.71
96	56	93.33	91	61	87.14
97	57	95.00	92	62	88.57
98	58	96.67	93	63	90.00
99	59	98.33	94	64	91.43
100	60	100.00	95	65	92.86
			96	66	94.29
			97	67	95.71
			98	68	97.14
			99	69	98.57
			100	70	100.00