K12 Senior High School Students Academic Performance Monitoring System for Private Institutions with Decision Support System

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ABSTRACT

The K to 12 Basic Education program uses standards and a competency-based grading system. These are found in the curriculum guides. All grades will be based on the weighted raw score of the learners' summative assessments. Senior High School Students have been graded on three categories the written work, performance tasks, and quarterly assessments. Technology plays a substantial role in helping teachers in the progress, communication, application, and grading of assessment tasks. Thus, this study aims to produce a feasible computerized grading system that will address these issues and problems encountered by the teachers in recording and monitoring grades. The developed K12 Senior High School Students Academic Performance Monitoring System for Private Institutions with Decision Support System was compliant with ISO 25010 quality standards as assessed by SHS Principal, SHS Faculty/ Teachers, and IT Experts. The developed system followed the policy and guidelines set by the department of education in the grading system. The decision support system of the developed system helped the senior high school principal and teachers in monitoring the grades and performance of the students in every subject. Monitoring the performance of the students academically and non-academically, and classifying the students who have at risk in their academic performance.

KEYWORDS

K to 12 Basic Education, competency-based grading system, Decision Support System, Senior High School Students, Academic Performance Monitoring System, ISO 25010 Quality Standards.

1. INTRODUCTION

Information technologies have affected every aspect of human activity and have a potential role to play in the field of education and training, especially, in distance education to transform it into an innovative form of experience. The need for new technologies in the teaching-learning process grows stronger and faster. Technology becomes a time of knowledge providing the complete and unmatched possibility for discovery, exchange of information, communication, and exploration to strengthen the teaching and student learning process. These can help the teachers and students have up-to-date information and knowledge.

Report grades represent teachers' student evaluationsof students' performance. Educators must ensure that grading and reporting always meet the criteria for validity and reliability. And

because of their primary communication purpose, teachers must also ensure that grading and reporting are correct, accurate, and fair. [1].

The K to 12 Basic Education program uses standards and a competency-based grading system. These are found in the curriculum guides. All grades will be based on the weighted raw score of the learners' summative assessments. The minimum grade required to pass a specific subject is 60, which is transmuted to 75 on the report card. The lowest mark that can appear on the report card is 60 for Quarterly Grades and Final Grades. Learners are graded on written work, performance tasks, and quarterly assessments every quarter. These three are given a specific percentage that varies according to the nature of the learning. [2]. Technology plays a substantial role in helping teachers in the development, communication, implementation, and grading of assessment tasks. [3]

Senior High School teachers feel that the time they need to take in the recording of class records. Computing for the grades of their student. With the help of computer technology, schools are taking advantage of a variety of grading systems. However, a greater majority, especially small schools, government schools, and schools in remote areas, still utilize the manual method of recording and computing for the grades of the students.

The researchers want to develop a computerized grading system to lessen the workload of teachers. The common problems encountered in manual recording, accuracy in computations of grades, synchronization of records. As the teacher's workload increases with growing amounts of grades and student lists that need to be attended to, it becomes tedious on the part of the teacher to capably manage them in time for file submission and reporting to higher education authorities. SHS Principal was not able to monitor the updates of class records in every teacher. Thus, this study aims to implement a workable computerized grading system that will address these issues.

1.1. Research Paradigm

This part of the study is about the research paradigm. The proposed study bore three major components: Input, Process, and Output.
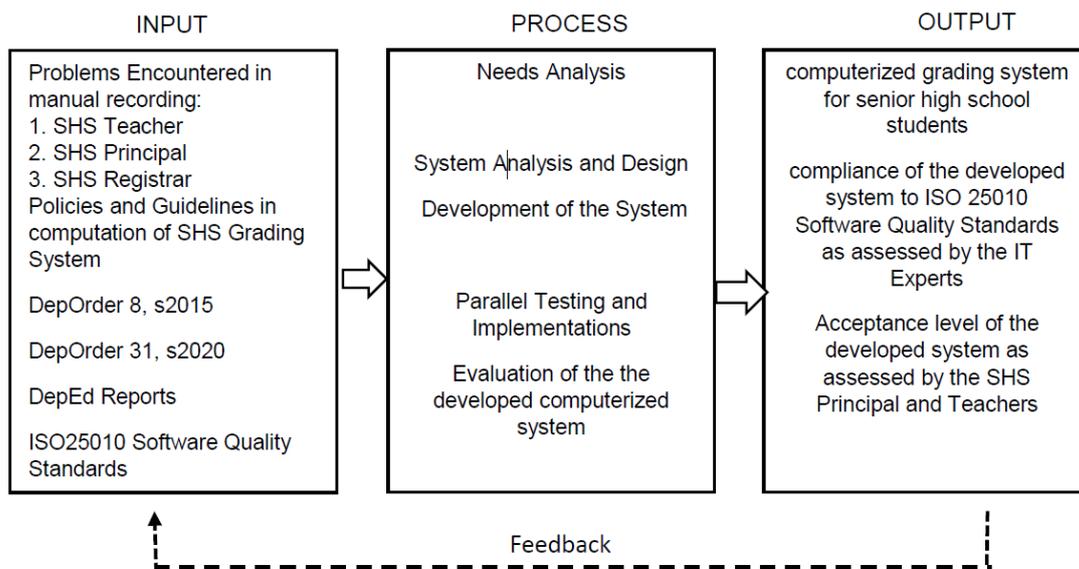

Figure 1. Research Paradigm

Fig. 1 Presents the paradigm of the study. Input includes the problem encountered in manual recording, policies, and guidelines in the computation of SHS Grading System, DepEd Order No. 8, s. 2015 and DepEd Reports. The process includes the need analysis and system design and development of System, Testing, and Evaluation. The direct target of this study is to develop K12 Senior High School Students Academic Performance Monitoring System for Private Institutions with Decision Support System, evaluate the level of compliance of the developed system to ISO 25010 Software Quality Standards as assessed by the IT expert, and assess the acceptance level of the system as assessed by the principal and SHS faculty.

1.2. Statement of the Problem

1. What are the problems encountered in the manual grading system in terms of?
   a. Computation of Grades and
   b. Monitoring of Grades
2. What computerized grading system with a decision support system can be developed for the Senior High School?
3. What is the level of compliance of the developed computerized system to ISO 25010 Software Quality Standards as assessed by the IT Expert in terms of:
   ➢ Functional sustainability;
   ➢ Performance efficiency;
   ➢ Compatibility;
   ➢ Usability;
   ➢ Reliability;
   ➢ Maintainability;
   ➢ Portability and
   ➢ Security.
4. What is the extent acceptance level of the developed system as assessed by the principal and senior high school teachers in terms of:
   ➢ Functional sustainability;
   ➢ Performance efficiency;
   ➢ Compatibility;
   ➢ Reliability;
   ➢ Maintainability;
   ➢ Portability and
   ➢ Security.

2. METHODS

2.1. Research Design

This study used a descriptive research design and system development methods. The descriptive method was used to determine the present status and condition of the Senior high school grading system to describe and understand the present environment. Environment analysis and need analysis were done on the adopted grading system of senior high school in this study. The existing senior high grading system policies and practices were analyzed to determine areas of computerization that can be performed for the development of the system, the Software Development Life Cycle (SDLC) methodology was used. This is to ensure that the phases in system development are done in the software building process. The Agile methodology of SDLC was adapted from the business understanding and requirements elicitation phase to testing the developed computerized grading system for senior high school students.
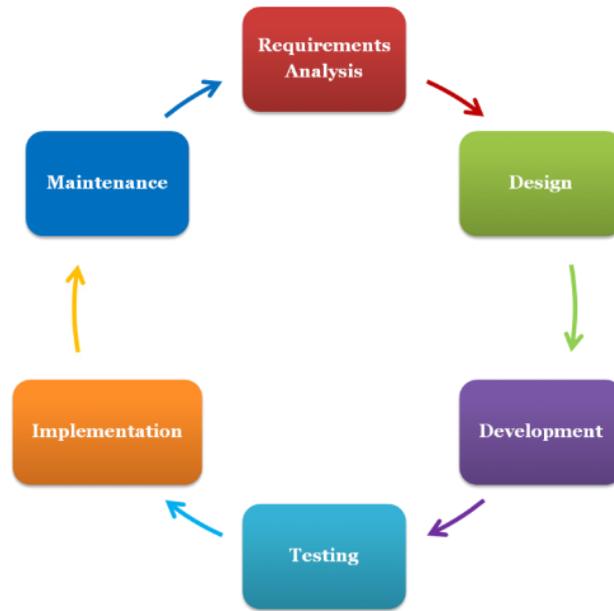
Figure 2. Agile Iterative Model

Fig. 2 Agile Iterative Model was adopted to guide the development of the computerized grading system for senior high [4]. Every iteration in system development involves the following process:

Requirement Analysis. In this procedure, the researcher accompanied a series of interviews with the Senior High School Principal and Teachers who typically administered and monitored the whole actions of the grading system. All the gathered data and information was studied by the researchers to come up with appropriate inputs in designing and developing the computerized grading system for senior high school students.

Design. The researcher chose the appropriate programming software, database, and hardware with which the developed system could be compatible. The researcher constantly coordinated with the users and top management on the features that are suitable for their needs.

Development. The activities involved here are the designing and coding of the user interface. During the development, there were a series of laboratory testing that was conducted in the different modules of the system. Compatibility testing was done and constant coordination with the users was made to align the users' specifications with the developed system.

Testing. In this procedure, the parallel testing of the developed system was done. The researcher collected comments from the testing teams which served as the basis for the modification and redesign of the system.

Implementation. The researcher executed the system in the Department of Senior High School at CVCITC, Santiago City. The system was installed and used. During the implementation phase, a series of training was made to the Principal and Teachers. Calibration and alignment of expectations of the users with the developed system were done.

Maintenance. In this process, the monitoring of the implementation and documentation of the use of the system was done. The problems and challenges encountered by the users were closely

recorded and reported. The errors and bugs encountered by the users including suggestions on better features were documented and fixed.
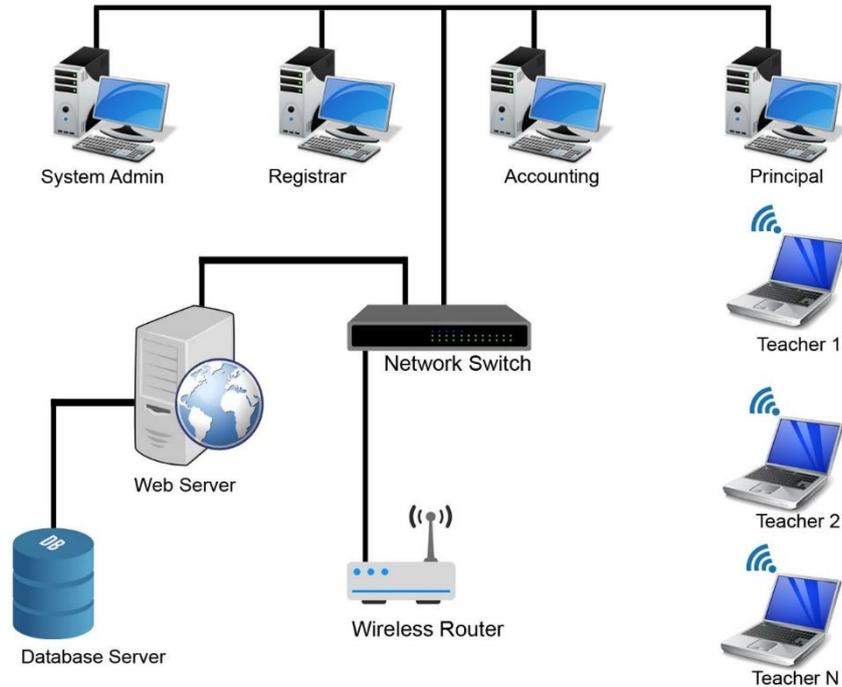
2.2. System Architecture

Figure 3. System Architecture

Fig. 3, shows the computerized grading system architecture. The system was designed with a centralized web-based system and database server. The data inputs from the system users were processed on the webserver in it will be stored in the central database server. The system admin is to monitor the overall performance of the system. Registrar is for inputting the student's information during the enrollment and for the subjects enrolled by the teachers. The accounting office is for monitoring the account of each student. Principal monitors the class records of each teacher. Monitoring the permanent records of senior high school students. To check the officially enrolled students for the current term. Teachers were the primary users of the system. They were the ones who input grades into the system. The teachers can check the officially enrolled students through their accounts and subjects. The system can be accessed through the local network wired or wireless.
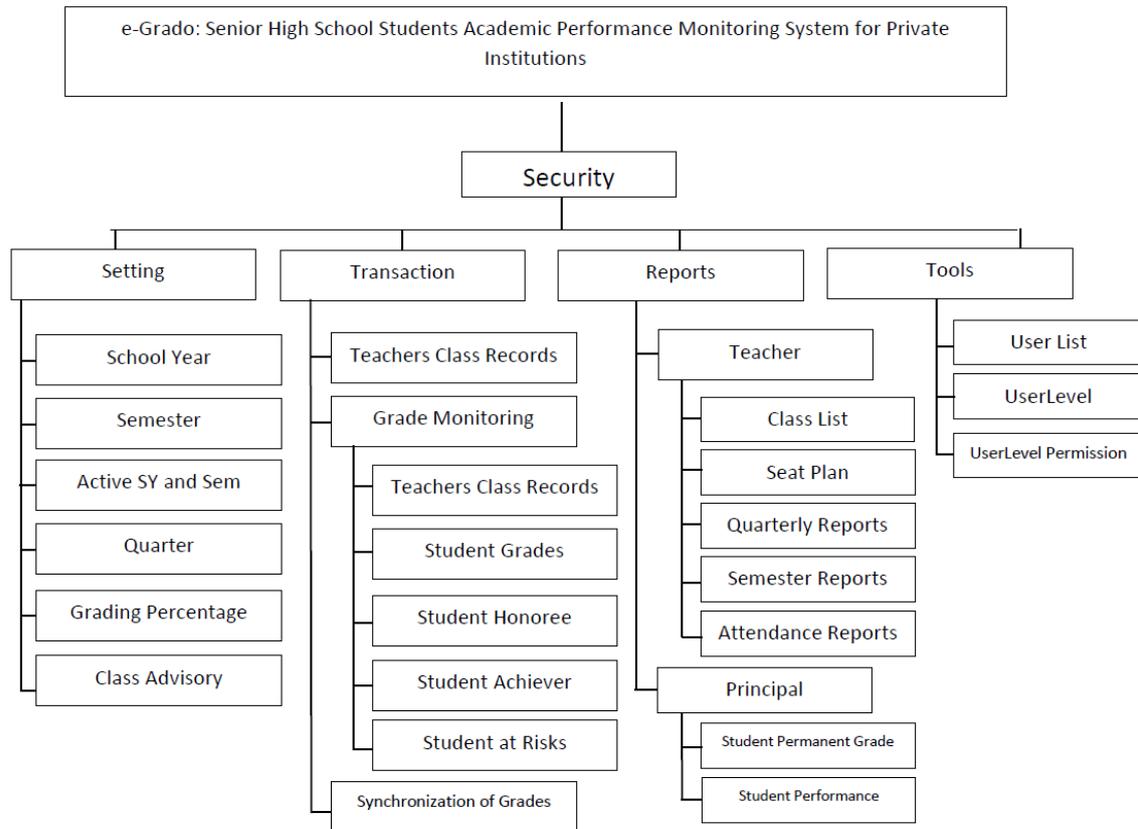
2.3. Hierarchical Input Process Output

Figure 4. Hierarchical Input Process Output

Figure 4 illustrates the Hierarchical Input Process Output of the system: This figure shows how the system works and the module and sub-modules of each process. It represents the overall design of the system being implemented and the requirements needed.

It is supported by the study of Farahat Ahmed (2015) Hierarchical Input Process Output of the system is a technique and tool for planning and/or documenting a computer program. The HIPO model contains a hierarchy chart that graphically represents the program's control structure and a set of IPO (Input-Process-Output) charts that define the inputs to, the outputs from, and the functions accomplished by each module on the hierarchy chart [6].

2.4. Respondents

There were 16 respondents of the study selected using purposive sampling to determine the practices and policies of the senior high school department. They provided inputs on the Users' specifications such as their needs and challenges. They were the ones directly involved in the operations of the senior high school grading system and the best personnel to get the needed inputs for consideration in the design process of the developed system.

Table 2. Respondents of the Study

Nature of Work	No. of Respondents
Principal	1
SHS Teachers	10
IT Experts	5
Total	**16**

The senior high school principal provided the top management perspective on how the senior high school grading system. How the computerized grading system willhelp in monitoring grades and preparation of reports using computerization? The senior high school teachers are considered as the main users of the system. They will be the ones to use the system, by recording the class records in the system. They also identified the reports that they needed from the developed system as part of the semester and annual reports. As users, they have expressed their report requirements and helped in the evaluation of the developed system. IT Experts will evaluate the performance of the system in terms of Functional sustainability; Performance efficiency; Compatibility; Usability; Reliability and Security.

2.5. Instrument

This study made use of a focus group discussion, observation checklist, interview guide, and documentary analysis.

2.6. Data Gathering Procedure

The researcher secured approval from School Administration and Senior High School Department, CVCITC Santiago City. The study also underwent an ethics review to ensure that there would be no violation of the Privacy Act. The researcher gathered data through a series of interviews. Focus Group Discussion (FGD) was also conducted with the Principal and Senior High School Teachers. The results were the basis of the researchers in the design and development of the system. The researchers conducted form and report evaluation as part of the data gathering procedure to have a deeper understanding of the current grading system. The developed system was tested and used by the users(Teachers and Principals) of the system and they were also involved in the evaluation of the interface of the system. Their recommendations were considered in the development of computerizing the grading system for senior high school.

2.7. Statistical Treatment of Data

Weighted mean was used as the statistical tool. In the evaluation of the developed system, five IT experts were topped, 1 principal and 10 SHS Faculty. The ISO 25010 Software Quality Standards was used as an instrument for assessing the developed system. The results gathered were analyzed employing the 4-point Likert.(4-Highly Accepted, 3-Accepted, 2-Not Accepted, 1-Highly Not Accepted)

Table 3. Likert Scale with Numerical Interpretation

Weight (Likert Scale)	Weighted Mean	Description
4	3.30-4.00	The measure described in the item is Highly Accepted.
3	3.30-4.29	The measure described in the item is Accepted.
2	2.30-3.29	The measure described in the item is Not Accepted.
1	1.00-2.30	The measure described in the item is Highly Not Accepted.

3. RESULTS

1. Issues and Problems Encountered in The Manual Grading System

1.1. Computation of Grades

By using the excel file provided by the DepEd in computing the grades of the students, here were the problems encountered by the teachers:

- occasional grades are not accepted in cells even if it is valid;
- cells in the spreadsheets are not automatically computing;
- there are circumstances that fields won't accept input, though it's a valid score;
- some grades were not accurate since some cells are not functioning;
- not easily detect if you inputted wrong values, most especially if you are preparing composite grades, report cards, and permanent record
- occasionally the columns in inputting scores are locked, it is not accessible for editing, especially when it was for completion and
- intrinsic clerical errors in the forms provided by the DEPED to teachers who may not have the technical knowledge to fix or even identify them.

1.2. Monitoring of Grades

The following were the problems encountered in the manual grading system in terms of monitoring of grades:

- not easy to determine failing students;
- class adviser hard to monitor of grades from other subjects;
- there is no indirect monitoring of teachers progress in recording students' grades;
- data inconsistency to the documents that teachers are submitting;
- the preparation of Student Composite Grades (computation of all grades from different courses/subject teachers), it needs more time and effort in completing the report;
- Time-consuming in evaluating students;
- No alternative backup copy of grades; and
- A printed copy is submitted to the office and the digital copy is not shared

2. The developed Senior High School Students Academic Performance Monitoring System for Private Institutions

Figure 5. Teacher's Class Records

In fig. 5 teachers' class records display the records in the written work, performance task, and Quarter Assessment. The percentage and weight of each component depend on the track of the programs as indicated in the Department of Education Order No. 8, s. 2015 Table No 5: Weigh of the component for SHS, Page 11[2] and under Department of Education Order No. 31, s. 2020 Grading and Promotion, Table 2: Weight Distribution of the summative assessment components for senior high school [5] The teacher has the privilege to edit a particular record or delete it in case of typographical errors. Computation of Initial Grade and Quarterly Grade based from DepEd Order No 8 Series of 2015, Policy and Guidelines on Classroom Assessment for the K to 12 Basic Education Program, Table 5. Weight of the Components for SHS and Table 7. Steps for Computing of Grades, and DepEd Order No 031 S. 2020, Interim Guidelines for Assessment and Grading in light of the basic education learning continuity plan, Grading and Promotion [5]. The quarterly grade was based on Appendix B. Transmutation Table under DepEd Order No Series of 2015, Policy and Guidelines on Classroom Assessment for the K to 12 Basic Education Program [2]. This module of the system solved the problems and issues encountered by the teacher, the teacher has the privileges to modify the grades, delete grades, and update the grades of the students. In the case of typo errors in the grades, the system has the features to check the score of the students and it will highlight the records which have errors to notify the teacher.

C V C I T C
CAGAYAN VALLEY COMPUTER AND INFORMATION TECHNOLOGY COLLGE, Inc.
SENIOR HIGH SCHOOL CLASS RECORD
(Pursuant in DepEd Order 8 Series Of 2015)

	REGION	2		DIVISION	Santiago City
	SCHOOL ID	401782		SCHOOL YEAR	SY 2020-2021

FIRST QUARTER		GRADE & SECTION: G11-HE-MASINOP		TEACHER: Winston G. Domingo			SUBJECT: Computer System Servicing 1						

| | | SEMESTER: First Semester | | | TRACK: TVL Track |

LEARNERS' NAME		WRITTEN WORK (30%)			PERFORMANCE TASKS (70%)						Quarterly Assessment(0%)			Initial Grade	Quarterly Grade
		1	2	Total	PS	WS	1	2	Total	PS	WS	Total	PS	WS		
HIGHEST POSSIBLE SCORE		15	10	25	100%	30%	10	100	110	100%	70%	0	100%	0%		
Male																
1 BINAG, JOHN PATRICK GONZAGA	Male	14	8	22	88.00	26.40	9	8	17	15.45	10.82	0	0	0	37.22	69
2 CALAD, JERIMAR GALUPE	Male	12	10	22	88.00	26.40	0	0	0	0.00	0.00	0	0	0	26.4	66
3 DOMINGO, WINSTON GACUSANA	Male	12	5	17	68.00	20.40	5	88	93	84.55	59.18	0	0	0	79.58	87

Total Number of Passed Students: 1
Total Number of Failed Students: 2

Prepared By   Checked By

_____   _____
WINSTON G. DOMINGO   Signature Over Printed Name
SHS Teacher   SHS PRINCIPAL

Figure 6. Teachers Quarterly reports

Fig. 6 Teachers Quarterly Reports, shows the result of student scores and grades in every quarter. Shows the performance progress of the student in the written task, performance tasks, and quarterly assessment. This report was submitted at the end of the quarter as part of teachers' reports. The format of this report is from table 5. Sample class records page 12 of DepEd Order No 8, series of 2015, Policy and Guidelines on Classroom Assessment for the K to 12 Basic Education Program [5]. The system will count the number of passed and failed students.

CVCITC	Home	E-Grade ▾							👤

AdviserSection   🏠 > AdviserSection

Class Advisory Section: G11-HE-MASINOP
School Year	SY 2020-2021 ⌄	Semester	Second Semester ⌄	Section	G11-HE-MASINOP ⌄	Search

LEGEND: **WW-Written Work | PT-Performane Task | QA-Quarterly Assessment | IG-Initial Grade | QG-Quarterly Grade**

No	Subject Info		Grading Percentage						Subject Teacher				
1	HE_FBS1-Food and Beverage Services 1		Written Work:30% | Performance Task:70% | Qtr Assessment:0%						JOHN CHRISTOPHER RIVERA				

			3rd QTR					4th QTR					
No	Student Name	Gender	WW	PT	QA	IG	QG	WW	PT	QA	IG	QG	Grade	Remarks
1	LINA, JERALD SARAOS	Male	20.25	49.70	0.00	69.95	81	20.33	44.60	0.00	64.93	78	80	PASSED
2	LUCERO, JHONDY DULAY	Male	0.00	0.00	0.00	0	60	0.00	2.40	0.00	2.4	60	-	INC
3	PINEDA, CZION JAMIRO BRAGN VELO	Male	21.75	46.90	0.00	68.65	80	21.33	44.60	0.00	65.93	78	79	PASSED
4	ALINDADA, CHRISTINE JOY BAJADO	Female	17.25	0.00	0.00	17.25	64	7.33	1.80	0.00	9.13	62	-	INC
5	ANTONIO, MARY CLAIR ALINDADA	Female	18.00	0.00	0.00	18	64	14.00	0.00	0.00	14	63	-	INC

SUBJECT MENU   HE_FBS1   HE_FBS1A   SHS_ENG2   SHS_ENG3   SHS_FIL2   SHS_LIT   SHS_PE2   SHS_PR1   SHS_SOCSCI   SHS_STAT

Figure 7. Adviser Section

Fig. 7 Advisers Section, the principal has to set the class advisory of the teachers. Only teachers with class advisory have access to these features. The adviser can check and monitor the real-time performance of its students under his/her advisory. Subjects under the particular sections will be listed below. The system will provide a summary of class records per subject. The computed Written Work, Performance Task, and Quarterly Assessment per quarter will be displayed. This feature of the computerized system address the a) the class adviser hard to monitor grades from other subjects; b) there is no indirect monitoring of teachers progress in recording students grades; c) data inconsistency to the documents that teachers are submitting; d) the preparation of Composite Grade (computation of all grades from different courses/subject teachers), you will need more time and effort in completing the report; and e) Time-consuming in evaluating students. Also, this feature of the system will be part of the decision support system.

Figure 8. Class Advisory Permanent Grade

Fig. 8 Class Advisory Permanent Grades, this feature of the system was only given to the class advisers. These will generate the permanent records of the per-student under his/her class advisory. This will help the teachers in class cards preparations every end of the semester. The system highlighted the grades with INC or Incomplete Remarks. This shows that the student needs to comply. This will answer the problems and issues encountered by the teachers in preparation of Composite Grade (computation of all grades from different courses/subject teachers), you will need more time and effort in completing the report, this will lessen their time and effort, to make the subject and grades report accurate on time.

Figure 9. Class and Grade Monitoring

Fig 9. Class and Grade Monitoring, these features of the system will produce access to the records of each teacher on their class records. Only the principal or the authorized user has the right to access these modules. This module can display a class list per subject of the teacher, class records for a particular quarter, semesterly report, synching of class records of the students to their permanent records then void/cancel the synched records in case some corrections need to be checked. This void/cancel will be only authorized and approved by the principal. The system will also display when the was the last date of recording of records. This will solve the concerns and

problems of the principal in no indirect monitoring of teachers' progress in recording students' grades, the principal can now check anytime the records of each teacher, and no need to print a hard copy.

Figure 10. List Student Honoree

Fig. 10. List of Student Honoree, the system will generate a list of possible honoree students. This report will be the basis of the senior high school department to determine the students with academic awards of "with highest honors", "with high honors" and "with honors" during the deliberation of awards, following the criteria with the Academic Excellence Award under DepEd Order 36, series of 2016, Policy Guidelines on Awards and Recognition For The K To 12 Basic Education Program [7].

Figure 11. List of Student Achiever

Fig. 11 List of Student Achiever, the system will generate a list of student achievers which the grades of these students did not meet the criteria of the criteria with the Academic Excellence Award under DepEd Order 36, series of 2016, Policy Guidelines on Awards and Recognition For The K To 12 Basic Education Program [7]. These reports will also be used in the preparation of special awards and to be used during the deliberation of awards.

Figure 12. List of Students at Risk

Fig. 12 List of Students at Risk, the system will generate a list of students with failed grades. These reports will be used also to determine the list of students that need to act with regards to their performance and grades. It will be used also during the deliberation of listing of candidates in graduation.

3. The level of compliance of the developed system to ISO 25010 Software Quality Standards as assessed by the IT Expert

Table 4: Level of compliance of the developed system to ISO 25010 Software Quality Standards as assessed by the IT Expert

ISO 25010 Software Quality Standards.	MEAN	Descriptive Rating
1) Functional Suitability	3.87	Compliant and Highly Accepted
2) Performance Efficiency	3.60	Compliant and Highly Accepted
3) Compatibility	4.00	Compliant and Highly Accepted
4) Usability	3.57	Compliant and Highly Accepted
5) Reliability	3.50	Compliant and Highly Accepted
6) Security	3.68	Compliant and Highly Accepted
7) Maintainability	3.72	Compliant and Highly Accepted
8) Portability	3.80	Compliant and Highly Accepted
GRAND MEAN	3.72	Compliant and Highly Accepted

Table 4 presents the result of the level of compliance of the developed system to ISO 25010 Software Quality Standards as assessed by the IT Expert that obtained the Grand mean of 3.72 with the descriptive rating of compliant and highly accepted. The indicator of ISO 25010 Software Quality Standards such as functional sustainability, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability got the descriptive rating of compliant and highly accepted. Therefore, it can be inferred that the developed application was highly approved and accepted by the IT experts.

4. The extent of acceptance level of the developed system as assessed by the principal and senior high school teachers

Table 5: The extent of acceptance level of the developed system as assessed by the principal and senior high school teachers

ISO 25010 Software Quality Standards.	MEAN	Descriptive Rating
1) Functional Suitability	3.76	Compliant and Highly Accepted
2) Performance Efficiency	3.70	Compliant and Highly Accepted
3) Compatibility	3.50	Compliant and Highly Accepted
4) Usability	3.65	Compliant and Highly Accepted
5) Reliability	3.66	Compliant and Highly Accepted
6) Security	3.60	Compliant and Highly Accepted
7) Maintainability	3.56	Compliant and Highly Accepted
8) Portability	3.64	Compliant and Highly Accepted
GRAND MEAN	3.63	Compliant and Highly Accepted

Table 5 presents the result to the extent of acceptance level of the developed system to ISO 25010 Software Quality Standards as assessed by the principal and senior high school teachers that obtained the Grand mean of 3.63 with the descriptive rating of compliant and highly accepted. The indicator of ISO 25010 Software Quality Standards such as functional sustainability, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability got the descriptive rating of compliant and highly accepted. Therefore, it can be inferred that the developed application was highly approved and accepted by the principal and senior high school teachers. Thus, it results in the full implementation of the developed system to be used by the SHS faculty and SHS Principal. Comply with all the requirements, policies, and guidelines of Department of Education Order No. 8, s. 2015, Policy on Classroom Assessment for the K to 12 Basic Education Program [5]

4. CONCLUSION

From the above findings, the researcher concluded that the existing manual system/by using Excel for the grading system of the SHS Department can be improved through the adoption of the developed system. The developed K12 Senior High School Students Academic Performance Monitoring System for Private Institutions with Decision Support System was compliant with ISO 25010 quality standards as assessed by SHS Principal, SHS Faculty/ Teachers, and IT Experts. The developed system followed the policy and guidelines set by the department of education in the grading system. The decision support system of the developed system helped the senior high school principal and teachers in monitoring the grades and performance of the students in every subject. To determine the performing students academically and non-academically, to identify the students who have at risk in their academic performance.

And from the findings and conclusions in this study, the researchers recommend the following;

1. The senior high school department may consider using the developed system in inputting of grades;
2. The school may consider acquiring hardware and better equipment capabilities that are necessary to improve the usability and functionality of the developed system;
3. Future researchers and system developers may consider the development of, report for student report card (FORM 138), Transcript of Records (FORM 137), improving

the decision support system features to data analytics, improving the interface design to be responsive in mobile devices to be integrated into the K12 Senior High School Students Academic Performance Monitoring System for Private Institutions with Decision Support System

ACKNOWLEDGMENT

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