

TOBRUK UNIVERSITY GRADING SYSTEM FOR COLLEGE OF NURSING VERSION 2 IN TOBRUK, LIBYA

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ABSTRACT

Grading is the process of applying standardized measurements of varying levels of achievement in a course. Grading measures the students' academic capability. Database Management System plays a vital role in recording information of any kind. Grades or students mark can be recorded in a repository. As the student performs, all academic measures were recorded into the database system, over the years it accumulated to a large amount. Recorded data were useful in educational data mining as unknown and hidden data patterns of all courses, database grading system of Tobruk University College of Nursing known as TUCON-GSv2 a successor to OMUCON-GSv1 can be used to extract and analyze this data. Database management system methods and implementations like recording of data in tables, queries and report, using Visual Basic as front end for the system and Microsoft excel as report, the system and the research performs according to what is needed and generated valuable findings. Overall the TUCON-GSv2 can produce helpful and meaningful data as it promoted simple educational data mining. The system serves as a vital element in the improvement of quality education for the College. The main purpose of this study is to document and present the performance and operation of the system from inception up to its present form, solve the report generation challenge for retaining the old format integrated in the new system and for the promotion of DBMS, Computer Science and Nursing Education in Tobruk, Libya.

KEYWORDS

Data Mining, DBMS, computer science, academic performance, Nursing Informatics

1. INTRODUCTION

Grading is defined in education as the process of applying standardized measurements of varying levels of achievement in a course[1].In most countries, all grades from all current classes are averaged to create a grade point average (GPA) for the marking period or a semester for Colleges and Universities. The GPA is calculated by taking the number of grade points a student earned in a given period of time [2].Academic performance suggests how well a student accomplished tasks and studies [3]. Student retention and performance are deemed as important issues for both educators and students [4].

Academic performance can be measured by different assessments like class test marks, lab performance, assignment, quiz and attendance [5]. The accumulated marks will then be averaged. The GPA was then evaluated in the following adjectival rating in Libya, 85-100% Perfect or Excellent, 75-84% Very Good, 65-74% Good, 50-64% Accepted and 0-49 as Failed/Unsatisfactory [6]. In Tobruk University College of Nursing (formerly Omar Al Mukhtar

University), assessment per class were manually recorded by the faculty members in what they called a mark list. The mark list is then given to the registrar's office for encoding, previously in Microsoft Excel worksheet that serves as their educational database. Eventually it was transformed into OMUCON-GSv1 created by the author, it utilizes student database grading system created with Visual Basic as front end and with MS-Access as its back end support, store students' personal information, educational performance for every subject with semesters and school year divided into several queries [7]. Implemented since academic year of 2010-2011, data storage and retrieval were made easy. It has undergone several changes in terms of operational aspects. In 2014 the author uses the system for a data mining research [7].

Database management system is a suite of computer software providing interface between users and databases [8]. Database has been explored and performed for many years, known as a collection of structured information about a subject or for a particular purpose [9]. The amount of data stored in educational database increases rapidly over the years [10] and so is the amount of data maintained in any electronic format increased noticeably, as the amount of information doubles so was the database at a greater pace [11]. Data was recorded as it was believed to be a source of potentially useful information [12]. Data in every bit has a lot of concealed information [13], as Collegiate education evolves so is the need to execute database management. Data mining on the other hand is a technology used to extract meaningful information and to develop significant relationship among variables stored in a data set [10, 11]. Currently Tobruk University College of Nursing Grading System version 2 or TUCON-GSv2 is the database system being used by the college. A successor to the OMUCON-GSv2 after the Tobruk branch of Omar Al Mukhtar University separated from the main campus in A.Y. 2015-2016 [14]. In this research, the proponent presented a Grading System custom built for the use of the College of Nursing. Exploring the uses and benefits of the system the study aimed to provide worthy educational data to the Institution in aid of improving educational competence and academic performance as a whole. The study also promotes the use of Database Management System to handle educational records.

2. MATERIALS AND METHODS

2.1 System and Data Presentation

The system will be presented using existing data sets of Academic performance by the students in the academic semester and the whole school year as well. Simple database management element approach and implementation was used to extract, analyze and present the data in useful format. The student database grading system TUCON-GSv2 was used to perform database management and statistical treatment of data. Collected data and system operation were organized into figures to permit ease of analysis. All data measures and its presentation were performed and generated by the software application TUCON-GSv2. Report generation codes of the actual system was also used.

2.2 Study Population

The study population consisted of 7 batches of students were all records are in the current system. Batch 2011, historically the 4th batch of students who entered the College of Nursing on Academic Year (AY) 2010-2011, and the pioneering batch to be entered in the system as 1st year students' in the College. Respectively Batch 2012 up to Batch 2017 was students' who entered the college in AY 2011-2012 until AY 2016-2017. Population was selected based on their student number hence named Batch number. Additionally older batches 2008, 2009 and 2010 were also in the system albeit with partial records in the old and in the new system.

2.3 Programming Technique

The proponent utilized the 4th generation technique (4GT) in the development of the Grading System based on NPL or Non- Procedural Language techniques. Depending on the specifications, the 4GT employ various tools for the automatic generation of source codes [15]. It is the vital tool which uses the non-procedural language for report generation, database query, data manipulation, user interface, code generation, spread sheet capabilities and more.

2.4 Software Application

Tobruk University College of Nursing Grading System Version 2 or TUCON-GSv2 is a software application that stores student information, subjects offered and academic records. The system was utilized to perform data measurement and presentation. The system was created using Visual Basic version 6 as front end, Microsoft Access for back end and Microsoft Excel for report generation.

2.5 Clinical Instructor

A clinical instructor co-authored the research to prove the integrity of the courses offered, operational aspect of the Nursing College and evaluation of data. Computational process of major nursing subjects especially the marks for Related Nursing Education (nursing laboratory) and Intensive Nursing Practicum (hospital base). The system is intended to benefit the Nursing College of Tobruk University, clinical instructor and faculty member, and nursing students.

3. The Grading System

Student report were recorded and extracted in TUCON-GSv2, figures will be used to present the actual screen shot of the system during its operation. Historical operation of the old system until the latest version will also be presented.

3.1 The old system

Prior to the OMUCON-GSv1, the College of Nursing uses Microsoft Excel to record and report the result of the academic performance of the students. Several worksheets' was used to represent every subject or course for a given semester or school year (the College started a yearly program for nursing instead of a semester). Another worksheet was used to present the result for all courses, GPA and rating, all worksheet combined will compose the workbook for 1 year level. Records and fields were mostly written in Arabic Language.

I	H	G	F	E	D	C	B	A
اسم الترخيص السوري								
الاسم	الرقم	الإصدار	المزاد	التميز	القبلي	العام	الدرجة	المرتبة
1	200802	4	9	1	16	30	16	30
2	200803	4	15	11	33	63	33	63
3	200804	4	10	16	20	50	20	50
4	200805	4	8	12	26	50	26	50
5	200806	5	24	19	48	96	48	96
6	200807	4	12	15	22	53	22	53
7	200808	4	13	13	41	71	41	71
8	200809	4	9	10	41	64	41	64
9	200810	4	15	15	44	78	44	78
10	200811	4	18	14	29	65	29	65
11	200812	4	17	15	35	71	35	71
12	200813	4	14	14	45	77	45	77
13	200814	4	14	10	42	70	42	70
14	200815	4	14	17	46	75	46	75
15	200816	4	11	14	21	59	21	59
16	200817	4	16	14	39	73	39	73
17	200818	4	12	9	33	58	33	58
18	200819	4	12	9	25	50	25	50
19	200820	4	10	5	17	36	17	36

Figure 1: Worksheet for one course

List No, Name, Student Number, Class Performance, Practical Exam, Major Exam, Final Result

As shown in Figure 1, the encoder will use this Excel worksheet to input the academic performance of the students after getting the manually written mark list from the faculty member. Every course uses a standard scoring although some faculty chooses to add or combine some criteria. Basically there are two possible course or subject, one with laboratory and one without laboratory. Lecture subjects without laboratory consist of class performance and major exam (midterm and final). Subjects with laboratory composed of class performance, laboratory exam and major exam. Passing mark is 50 and above for all subjects, although when the program shift from yearly to semester, major nursing subjects passing mark was set to 60 or higher.

Academic Position	Percent	Total	Pharmacology	Physiology	Anatomy	Pathology	Microbiology	Immunology	Control No.	Name	N. O.
Rating	Result	%	1000	100	100	100	100	100	100		
مجتهد	مجتهد	41.0	410	64	50	43	33	50	50	200802	1
مجتهد	مجتهد	53.7	537	57	60	66	50	50	54	200803	2
مجتهد	مجتهد	34.0	340	65	76	59	26	34	50	200804	3
مجتهد	مجتهد	27.8	278	63	28	43	5	28	35	200805	4
مجتهد	مجتهد	94.2	942	76	99	100	96	96	96	200806	5
مجتهد	مجتهد	27.1	271	50	28	33	7	29	36	200807	6
مجتهد	مجتهد	36.9	369	67	33	78	11	24	38	200808	7
مجتهد	مجتهد	38.1	381	63	37	67	8	39	50	200809	8
مجتهد	مجتهد	75.4	754	79	82	86	80	75	71	200810	9
مجتهد	مجتهد	64.9	649	70	68	59	57	61	76	200811	10
مجتهد	مجتهد	69.9	699	78	57	66	54	51	84	200812	11
مجتهد	مجتهد	59.7	597	76	60	91	65	50	67	200813	12

Figure 2: 1st Assessment Report: Final Result, Total, GPA and Rating

After encoding into individual course worksheet, another worksheet will present the accumulated marks of all students for every course, the aggregation of the mark as Total, the average as Percent equivalent or GPA and academic position as evaluation rating. Academic position is divided into two, result and rating. Result is either the students passed if they passed all their subjects or take 2nd assessment equivalent to a removal exam at a later time. Rating is when GPA was evaluated using Libya’s standard rating, 85-100% Perfect or Excellent, 75-84% Very Good, 65-74% Good, 50-64% Accepted and 0-49 as Failed/Unsatisfactory. Subjects and the rest of the column fields were translated to English language for reference only.

Academic Position	Percent	Total	Pharmacology	Physiology	Anatomy	Pathology	Microbiology	Immunology	Control No.	Name	N. O.
Rating	Result	%	1000	100	100	100	100	100	100		
مجتهد	مجتهد	40.7	407	64	50	39	27	50	50	200802	1
مجتهد	مجتهد	52.1	521	57	68	66	50	50	50	200803	2
مجتهد	مجتهد	52.8	528	65	66	66	3	50	50	200804	3
مجتهد	مجتهد	21.4	214	63	59	4	7	27	33	200805	4
مجتهد	مجتهد	16.6	166	50	24	8	0	19	7	200807	6
مجتهد	مجتهد	42.0	420	67	68	78	21	26	26	200808	7
مجتهد	مجتهد	37.6	376	63	22	57	7	50	50	200809	8
مجتهد	مجتهد	68.4	684	70	65	65	59	57	61	200811	10
مجتهد	مجتهد	60.1	601	67	67	64	51	84	63	200812	11
مجتهد	مجتهد	64.0	640	76	60	61	65	60	67	200813	12
مجتهد	مجتهد	68.2	682	70	63	65	59	60	50	200815	14

Figure 3: 2nd Assessment Report: Final Result, Total, GPA and Rating

There are two reports that the registrar prints after the exam period (Figure 1, Figure 2). The 1st assessment report was produced after the final exam and the 2nd assessment report or the result after the students have taken the removal exam. The difference between the two reports was that

in 2nd assessment there will be 6 possible results, Passed if they passed all their courses, Passed with 1 carrier subject, Passed with 2 carrier subjects, Repeat the School level, Failed/ change program, Reported absent/not attending classes/exam. Those who passed all subjects in the 1st assessment report will not be included in the 2nd assessment report. The student can be promoted to the next year level even if they fail 1 or 2 courses, the failed courses will be loaded to the list of subjects the following school year. If they fail 3 or more courses then they have to repeat the school level until they passed all the remaining subjects they failed. If the GPA of students is less than 35%, they will be advice to change program and will not be accepted in the college again.

3.2 OMUCON-GSv1

In 2009, the College of Nursing changes their program from yearly to semester period. The course outline was improved, more subjects were added, and passing mark for nursing subjects was increased from 50 to 60. As the need for an organized database increased in 2010 the management of CON suggested the creation of a Grading System. The author created the database in Microsoft Access, using Visual Basic for User Interface. Eventually after a series of test for report, the author decided to use Microsoft Excel for report generation called by a procedure in Visual Basic.



Figure 4: Modified Splash Screen of OMUCON-GSv1 (Version 2)

Figure 4 shows the splash screen of OMUCON-GSv1, the last and latest design while the College of Nursing is still under Omar Al-Mukhtar University. Version 1 and version 2 of OMUCON-GS is pretty much the same albeit different logo and some update in the database were introduced.

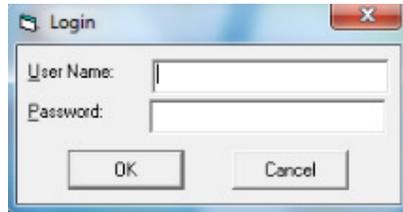


Figure 5: Login Module for OMUCON-GSv1

In figure 5, the username and password login was displayed. Only the registrar, exam supervisor and encoder were entrusted the security login to prevent unauthorized access.

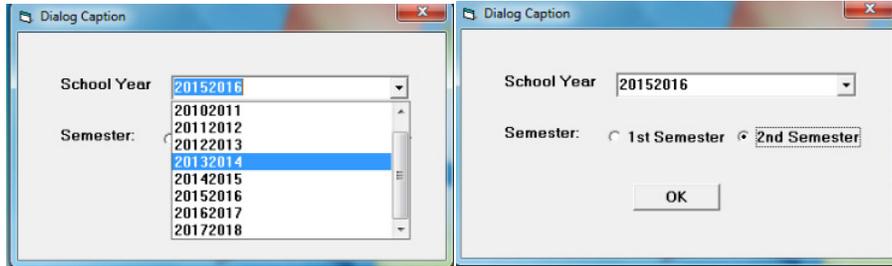


Figure 6: School Year and Semester Selection for OMuCON-GSv1

Since the inception of the semester program, the Grading system was designed to fit the school year and semester division (Figure 6). First the operator must choose the school year to generate then choose which semester, then click Ok button to proceed to the next module.

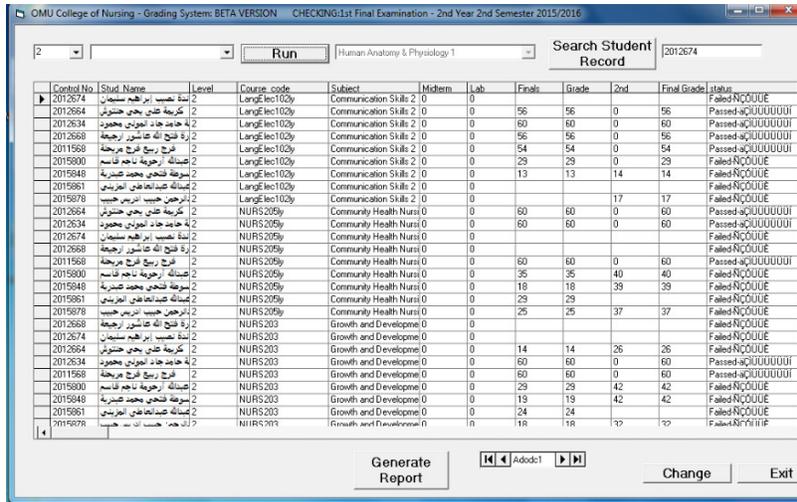


Figure 7: Main Module of OMuCON-GSv1

The main module of OMuCON-GSv1 as shown in figure 7 lets the user to choose the school year and the department if necessary in the combo box above. A search button for course and student records filtered by their student number for accurate posting is also included. The Generate Report button will be used for generating the result in a spreadsheet. Change button to choose another school year and semester. Exit button to close the program.

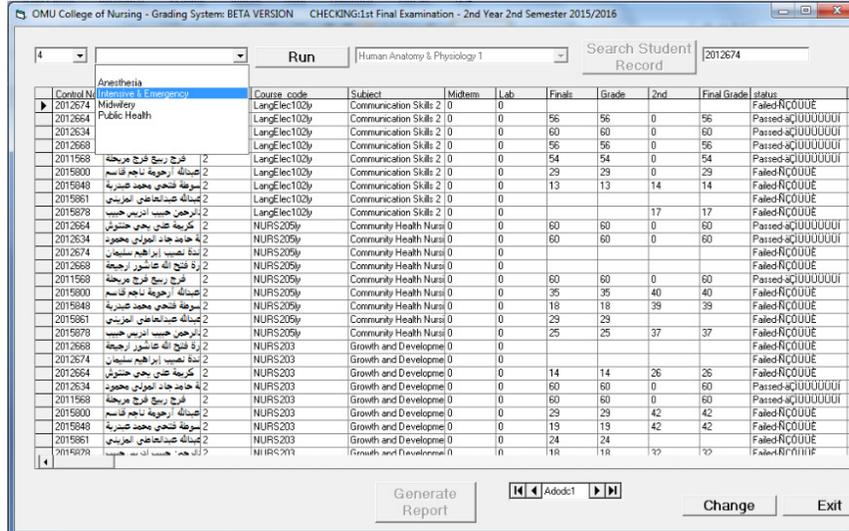


Figure 8: Operating the Main Module of OMUCON-GSv1

In order for the report to be generated, the year level must be selected and the department if the year level is 3rd or 4th year level. Previous department includes Anesthesia, Intensive and Emergency, Midwifery and Public Health nursing. Generate Report button is disabled by default and can only be activated when proper year level is selected.

Gen. Results (النتائج العامة)	Rating (التقدير العام)	Gen. Ave. (المتوسط العام)	Total (المجموع)	Strategies in Health Education (3)	Nursing Research (2)	Nursing Ethics & Jurisprudence (3)	Microbiology and Parasitology (3)	Arabic Language (2)	Human Anatomy and Physiology (3)	Control No.	Name	No.
ناجح	مقبول	63.81	1021	53	60	73	50	86	67	200850	احمد تاشيف ابراهيم	1
فوق نافع	ممتاز	57.53	921	58	45	75	101	95	51	2008123	ابراهيم مصطفى خليل محمد	2
ناجح	جيد جدا	79.81	1277	70	60	93	75	97	83	2008203	سعاد يحيى الغرابي	3
ناجح	جيد	71.91	1151	68	60	79	59	93	76	2009418	محمد سعد علي	4
ناجح	جيد جدا	82.56	1321	88	79	90	64	97	81	2009419	رحاب اشرف فرج عبدا لملوكي	5
ناجح	جيد	67.19	1075	57	60	81	52	95	65	2009420	ناصر ابراهيم خطاب	6
ناجح	جيد	70.19	1125	59	71	84	57	87	69	2009423	سعاد فتح الله محمد خنيرة	7
ناجح	جيد	71.72	1148	77	74	80	57	97	55	2009425	سنداح اسماعيل الطيف	8

Figure 9: Report Generated by OMUCON-GSv1

The result will be generated in a spreadsheet as shown in figure 9, the worksheet were automatically locked to prevent alteration.

The screenshot shows a report for the 1st Final Examination - 2nd Year Intensive & Emergency 2013/2014. The table lists 47 students with their names, IDs, and scores in 11 subjects: Total (General Average), Pharmacology (2), Pathology (2), Microbiology and Parasitology (2), English Language (2), Community Health Nursing (2), Communication Skills (2), Nursing Ethics & Jurisprudence, Microbiology and Parasitology, Human Growth and Development, English Language (2), and Biostatistics (2). The report uses color coding: passing marks are in black text on a white background, while failing marks are in red text on a blue shaded background.

Figure 10: Report Generated by OMUCON-GSv1 (improved color coding)

Early design of the report was a little bit plain in terms of appearance, the exam supervisor suggested changes in the color coding were passing marks will appear in black text and white background cell, failing mark will be displayed in red text and blue shaded background as shown in Figure 10. Unlike the original worksheet for the College’s grading system, the evaluation rating will only be given if the student passed all their subjects. Carrier subjects were placed after the general average or GPA thus suggesting it’s not included in the computation of Total and General Average but counted as a course. Since the College is an Arabic institution, reports were posted in a right to left format. The name and evaluation remained written in Arabic language.

The screenshot shows a report for the 1st Final Examination - 3rd Year Intensive & Emergency 2014/2015. The table lists 18 students with their names, IDs, and scores in 11 subjects: Total (General Average), Nursing Specialization (2), Nursing Research (2), Mental Health & Psychiatric Nursing, Intensive Nursing Practicum (2), Communication Skills (2), Medical Surgical Nursing (2), Mental Health & Psychiatric Nursing, Intensive Nursing Practicum (2), Communication Skills (2), and Medical Surgical Nursing (2). The report uses color coding: passing marks are in black text on a white background, while failing marks are in red text on a blue shaded background.

Figure 11: Report Generated by OMUCON-GSv1 (Version 2)

After a couple of years of software implementation, the University changes its official logo and courses offered, thus minor changes in design were added to the system (Figure 11). Similar with the first grading system, the report to be submitted by the registrar included the result of the 1st final exam and 2nd final exam. Students who passed all subjects on 1st assessment will not be included in the report of the 2nd assessment.

3.3 TUCON-GSv2

In the middle of school year 2015-2016 the Colleges in the Tobruk Branch of Omar Al-Mukhtar University separated from the main campus thus they establish Tobruk University. Changes in the logo, school and system operation prompted the author to redesign the system albeit with minimal configuration.

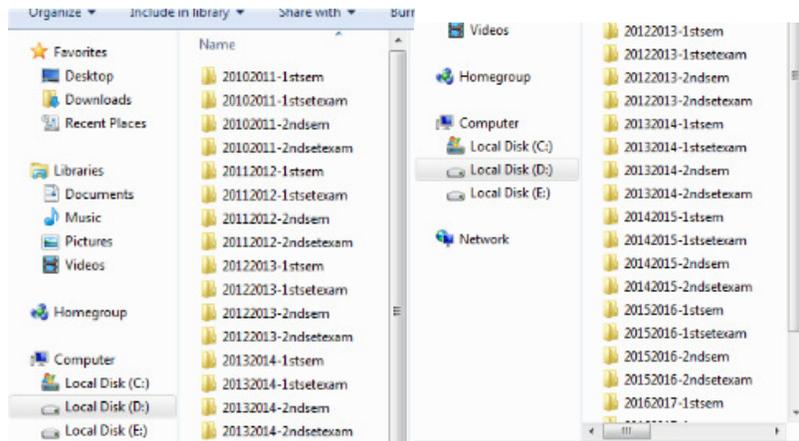


Figure 12: Folder of Report Generated by OMUCON-GSv1 and TUCON-GSv2

TUCON-GSv2 is an update of OMUCON-GSv1 and the records and report produced by the latter were integrated to the new system. The same database were still being used for the new system, the report were saved as a worksheet file and sorted according to school year and semester as seen in figure 12.

Jahrbak University Faculty of Nursing														
2nd Final Examination - 4th Year Intensive & Emergency 2015/2016														
Gen. Average (المتوسط العام)	Carrier Subjects	Rating (التقييم)	Final (المجموع النهائي)	Nursing Specialization 4(2)	Nursing Research 2(3)	Nursing Leadership and Plan	Intensive Nursing Practicum 3(2)	Emergency Nursing Practicum	Emergency Nursing Practicum	Discharge Emergency & Trauma	Medical Surgical Nursing 3(4)	Control	Name	No
66	Microbiology 1	64.88	2118	65	60	67	60	60	60	60	60	60	2008129	1
		68.09	2181	60	60	60	60	60	60	60	60	60	2008258	2
		72.21	248	61	60	60	60	60	60	60	60	60	2010568	3
		71.06	2345	60	60	77	76	72	83	60	60	60	2011668	4
		55.67	1837	68	60	68	61	60	84	60	60	60	2011670	5
		68.42	2258	60	60	60	75	65	83	60	61	60	2011673	6
		50.57	1682	60	60	60	60	60	66	61	60	60	2011675	7
		43.25	1427	60	60	60	61	62	60	60	60	60	2011680	8
		53.27	1958	61	60	68	77	81	68	78	60	60	2012638	9
		71.45	2350	63	67	77	73	79	80	64	60	60	2012661	10
		70.79	2336	68	68	79	74	72	76	62	60	60	2012677	11

Figure 13: Report Generated by TUCON-GSv2

Report generated by TUCON-GSv2 list the students name, control number, subjects taken, total, Gen. average or GPA, evaluation rating if they passed all subjects, Carrier or loading subjects retaken if present and general result or status.

Control	Name	No
1	الراجي ابراهيم	1
2	ياسمين محمد عبد الحليم	2
3	الفرجة علي حسن خورش	3
4	عبدالله محمد عبد الحليم	4
5	ياسمين محمد عبد الحليم	5
6	احسان محمد عبد الحليم	6
7	ياسمين محمد عبد الحليم	7
8	ياسمين محمد عبد الحليم	8
9	ياسمين محمد عبد الحليم	9
10	ياسمين محمد عبد الحليم	10
11	ياسمين محمد عبد الحليم	11
12	ياسمين محمد عبد الحليم	12
13	ياسمين محمد عبد الحليم	13
14	ياسمين محمد عبد الحليم	14
15	ياسمين محمد عبد الحليم	15
16	ياسمين محمد عبد الحليم	16
17	ياسمين محمد عبد الحليم	17

Figure 14: Report Generated by TUCON-GSv2 after the 2nd Final Examination

Sometimes transferee students from another colleges were subjects offered was taken on a different school year, it will be added as a special subject for the students in a different column after the students rating. “غ” is an Arabic word meaning absent, if the student did not take the final exam, they will be marked absent from the course, this mark is equivalent to 0 when GPA was computed.

Control No.	Stud_Name	Level	Course_code	Subject	Midterm	Cs	Lab	Finals	Grade	2nd	Final Gr.	status
2010-2011 1st Sem	ياسمين محمد عبد الحليم	1	BIOL101ya	*Human Anato	9	8	2	10	29	0	0	Failed
2010-2011 2nd sem	ياسمين محمد عبد الحليم	1	BIOL101ya	*Human Anato	18	16	33	83	0	0	83	Passed
2011-2012 1stsem	ياسمين محمد عبد الحليم	2	BIOL101ya	*Human Anato	12	9	9	21	31	0	0	Failed
2012-2013 1stsem	ياسمين محمد عبد الحليم	3	BIOL101ya	*Human Anato	18	17	18	33	86	0	0	Passed
1stsem1stsem20122013	ياسمين محمد عبد الحليم	4	BIOL101ya	*Human Anato	0	0	0	50	50	0	0	Failed
2ndyear1stsem20122013	ياسمين محمد عبد الحليم	4	BIOL101ya	*Human Anato	10	16	6	23	35	0	0	Passed
3rdyear1stsem20122013	ياسمين محمد عبد الحليم	4	BIOL101ya	*Human Anato	11	16	5	21	33	0	0	Passed
3rdyear1stsem20122013	ياسمين محمد عبد الحليم	4	BIOL101ya	*Human Anato	9	16	4	14	43	0	0	Failed
3rdyear1stsem20122013	ياسمين محمد عبد الحليم	4	BIOL101ya	*Human Anato	12	17	7	22	38	0	0	Passed
3rdyear1stsem20122013	ياسمين محمد عبد الحليم	4	BIOL101ya	*Human Anato	11	7	10	14	42	0	0	Failed
3rdyear1stsem20122013	ياسمين محمد عبد الحليم	4	BIOL101ya	*Human Anato	8	5	3	25	41	0	0	Failed
3rdyear1stsem20122013	ياسمين محمد عبد الحليم	4	BIOL101ya	*Human Anato	12	9	6	14	41	0	0	Failed
3rdyear1stsem20122013	ياسمين محمد عبد الحليم	4	BIOL101ya	*Human Anato	11	13	1	24	49	0	0	Failed
3rdyear1stsem20122013	ياسمين محمد عبد الحليم	4	BIOL101ya	*Human Anato	12	17	1	8	38	0	0	Failed
4thyear1stsem20122013	ياسمين محمد عبد الحليم	1	BIOL101yb	*Physiology 1	0	13	12	25	50	0	0	Passed
4thyear1stsem20122013	ياسمين محمد عبد الحليم	1	BIOL101yb	*Physiology 1	0	0	0	25	25	0	0	Failed
2011-2012 2ndsem	ياسمين محمد عبد الحليم	1	BIOL101yb	*Physiology 1	0	0	0	50	50	0	0	Passed
2012-2013 2ndsem	ياسمين محمد عبد الحليم	1	BIOL101yb	*Physiology 1	0	14	6	23	33	0	0	Failed
2013-2014 1stsem	ياسمين محمد عبد الحليم	1	BIOL101yb	*Physiology 1	0	0	0	52	52	0	0	Passed
2013-2014 2ndsem	ياسمين محمد عبد الحليم	1	BIOL101yb	*Physiology 1	0	0	0	61	61	0	0	Passed

Figure 15: Datasheet View of OMUCON-GSv1 and TUCON-GSv2

Since TUCON-GSv2 is an update of OMUCON-GSv1, they are using the same database or back end. All records from the previous system and the current generated records were in the same repository table, separated via query per year level and department, grouped according to school year and semester. In figure 15 listed the datasheet view of the query for 1st year 1st semester 2013-2014. The fields for user input includes students control no, student name, level, course code, subject/course, midterm exam, class standing, laboratory, final exam, grade, 2nd, final grade and status. All student performance will be added to form the grade and will be generated as 1st assessment report. Blank final exam (Finals field) will be reported as absent. If the student passed (Grade Field) it will be their Final Grade, if the student took 2nd assessment it will be encoded in the 2nd field and it will be their new Final Grade if the subject is purely lecture. If the course is with laboratory, it will add the lab mark (20%) and the 2nd exam (80%) to form a new final grade. Status will be either passed or failed.

Control No.	Stud Name	Level	Group	Course Code	Subject	Grade	2nd Final	Carrier	Carrier2	Final Grade	status	sem
2012629	أحمد ميمون العويحي	2		NURS103ly	Fundamentals	0	0	1	0	1	Failed-راسب	carrier
2012625	زيد احمد قور	3		NURS201ly	Human Growth	27	34	60	0	60	Passed-المرتب	1st
2012655	مهاجر فرج عثمان	5	Intensive & Err	NURS305ly	Mental Health	30	43	60	0	60	Passed-المرتب	1st
2012632	أحمد محمد راجح	5	Public Health	NURS305ly	Mental Health	34	27	60	0	60	Passed-المرتب	1st
2012648	أهلبه امراجع هاشم	5	Intensive & Err	NURS305ly	Mental Health	37	20	70	0	70	Passed-المرتب	1st
2012673	جمعة صلاح جمعة	5	Anesthesia	NURS305ly	Mental Health	23	27	60	0	60	Passed-المرتب	1st
2012636	سماي قح الله محمد	5	Public Health	NURS305ly	Mental Health	35	33	73	0	73	Passed-المرتب	1st
2016520	منة عبدالقادر ناصر	4	Anesthesia	NURS305ly	Mental Health	22	-1	60	0	60	Passed-المرتب	1st
2008129	بن قاسم محمد احمد	5	Intensive & Err	BIOL201ly	Microbiology a	0	0	24	0	24	Failed-المرتب	carrier
2011561	رشاد سعيد عويحي	3		ETH200ly	Nursing Ethics	0	0	-1	0	-1	Failed-المرتب	carrier
2011601	إيهب شهاب انريس	5	Intensive & Err	NURS301ly	Nursing Specia	0	0	62	0	62	Passed-المرتب	carrier
2012649	سماي هادي رحيل	5	Public Health	NURS301ly	Nursing Specia	26	30	42	63	63	Passed-المرتب	1st
2016531	أحمد عبدالرحمن	3		PHARM100ly	Pharmacology	0	0	-1	0	-1	Failed-المرتب	carrier
2012668	الله عثمان ارمجة	2		NURS102ly	Related Learnii	0	0	17	0	17	Failed-المرتب	carrier
2013712	جمعة عرابي سالم	4		NURS102ly	Related Learnii	0	0	60	0	60	Passed-المرتب	carrier
2013708	نور محمد شمس الدين	3		NURS102ly	Related Learnii	0	0	60	0	60	Passed-المرتب	carrier
2016531	أحمد عبدالرحمن	3		NURS202ly	Related Learnii	0	0	-1	0	-1	Failed-المرتب	carrier
2011592	عبدالرحمن عامر	3		NURS202ly	Related Learnii	0	0	1	0	1	Failed-المرتب	carrier
2012664	آية علي يحيى جلال	2		NURS101ly	Theoretical Foe	0	0	35	62	62	Passed-المرتب	carrier
2014754	سماي محمد احمد	5		NURS101ly	Theoretical Foe	25	15	65	0	65	Passed-المرتب	1st

Figure 16: Datasheet View of OMUCON-GSv1 and TUCON-GSv2 of students with carrier

Some students who failed one or two subjects were given the privilege to be promoted to the next year level. The subjects they fail will be carried the following school year, students with carrier will be in a query were grade and 2nd final grade were already listed from the previous year. There are two carrier repository; Carrier for 1st take and Carrier2 for 2nd assessment if the student still fails the 1st carrier exam. The last exam they took will be their Final Grade, if they still fail even the 2nd carrier exam, the course will be listed as carrier the next school year provided they did not fail more than two subjects including the carrier course.

Control No.	Subject	Grade	2nd	Carrie	Carrier	Final G	sem	SY	units
2012624	*Human Anatomy 1	52	0	0		52	1st	20112012	1.5
2012624	*Physiology 1	48	0	0		48	1st	20112012	1.5
2012624	Arabic Language	68	0	0		68	1st	20112012	2
2012624	Biochemistry 1	63	0	0		63	1st	20112012	3
2012624	English Language 1	62	0	0		62	1st	20112012	3
2012624	Medical Sociology	50	0	0		50	1st	20112012	2
2012624	Related Learning experience 1	70	0	0		70	1st	20112012	2
2012624	Theoretical Foundation of Nursing	60	0	0		60	1st	20112012	4
2012624	*Human Anatomy 2	45	0	0		45	2nd	20112012	1.5
2012624	*Physiology 2	55	0	0		55	2nd	20112012	1.5
2012624	Biochemistry 2	58	0	0		58	2nd	20112012	3
2012624	English Language 2	44	0	0		44	2nd	20112012	3
Total									205

Figure 17: Datasheet View of OMUCON-GSv1 and TUCON-GSv2 of a searched student

Sorting and organizing of records using the same database file prompted the author to use the Microsoft Access as back end. It is also easier to use compared to other database system. Searching students by their control number especially if the operator is a non-Arabic speaking person. Sorting and searching of records were easier in this database compared if the records are all in a spreadsheet.

Course Code	Subject	Lec. Un.	Lab. ur.	Clinica.	Sem. It.	Description	Status
PATH100y	Patho Physiology	3	0	0 21	Major Subject	Current	
PHARM100y	Pharmacology	3	0	0 21	Major Subject	Current	
NURS301y	Maternity Nursing	4	0	0 21	Major Subject	Current	
NURS202y	Related Learning Experience 3	0	2	0 21	Major Subject	Current	
NURS205y	Community Health Nursing	3	0	0 22	Major Subject	Current	
EDUC200y	Strategies in Health Education	3	0	0 22	Minor Subject	Current	
LangSec102y	Communication Skills 2	2	0	0 22	Minor Subject	Current	
NURS204y	Related Learning Experience 4	0	2	0 22	Major Subject	Current	
ETH200y	Nursing Ethics & Jurisprudence	3	0	0 22	Major Subject	Current	
NUT200yB	Therapeutics Dietetics	2	0	0 22	Major Subject	Current	
NURS203y	Growth and Development	2	0	0 22	Major Subject	Current	
NURS301y	**Adult Nursing 1	8	0	0 31	Major Subject	Current	
NURS301yb	*AN1 (CardioPulmonary)	4	0	0 31	Major Subject	Current	
NURS302y	Pediatric Nursing	2	0	0 31	Major Subject	Current	
NURS303y	Intensive Nursing Practicum 1	0	0	7 31	Major Subject	Current	
ENGL303y	English Language 3	3	0	0 31	Minor Subject	Current	
NURS301ya	*AN1 (Renal System)	4	0	0 31	Major Subject	Current	
INFOR100y	Intro to Computer with Nursing Info	2	1	0 31	Minor Subject	Current	
Math100y	Epidemiology Biostatistics	3	0	0 32	Minor Subject	Current	
NURS303y	Intensive Nursing Practicum 2	0	0	7 32	Major Subject	Current	
LangSec103y	Communication Skills 3	2	0	0 32	Minor Subject	Current	

Figure 18: Datasheet View of current courses offered for TUCON-GSv2

Main records were grouped into 3 tables, Stud_records, Stud_info and Subject_tb. Stud_info list the student's information using a unique field control_no, other info like name, year level, department, check box if they are a current student or if they were a graduate already. In the database if the student's year level is 5, it means they finished the whole program already. They were only shown here for record retrieval example. In figure 18 the table for Subject_tb were shown listing the course code, name of the subjects/course, Lecture units, laboratory Units, Clinical Units (for INP, hospital duty), Year and Semester offered (31 means, 3rd year 1st semester, 22 means 2nd year 2nd semester), Description if the subject is major or minor (general course) and Status if the subject is currently offered or the subject was discarded from the program.

Student Name	Level	Course Cl.	Subject	Duty	Cs.	Lab/C.	Finals	Grad.	Zn.	Final G.	Status
أحمد عيسى عبد الحامد صالح	5	NURS406y	Intensive Nursing Practicum	53	0	0	22	75	0	75	Passed
عائشة أريكة محمد صالح	5	NURS406y	Intensive Nursing Practicum	54	0	0	24	78	0	78	Passed
نهادي إبراهيم محمد أرفق	5	NURS406y	Intensive Nursing Practicum	59	0	0	26	85	0	85	Passed
عزراة هادي عويش عويش	5	NURS406y	Intensive Nursing Practicum	50	0	0	22	72	0	72	Passed
أزلة أريكة سالم عبدالرؤف	5	NURS406y	Intensive Nursing Practicum	55	0	0	20	75	0	75	Passed
ولاد عبدالخالق مخلوف حويش	5	NURS406y	Intensive Nursing Practicum	51	0	0	27	78	0	78	Passed
احمد مسعود حويش	5	NURS406y	Intensive Nursing Practicum	52	0	0	25	77	0	77	Passed
عندرية عبدالودود مسعود مكيال	5	NURS406y	Intensive Nursing Practicum	47	0	0	15	62	0	62	Passed
حورية فرح عندرية عبد الله	5	NURS406y	Intensive Nursing Practicum	44	0	0	24	68	0	68	Passed
أحمد إبراهيم عويش عبدالرؤف	5	NURS406y	Intensive Nursing Practicum	47	0	0	15	62	0	62	Passed
رفيف هادي محمد عثمان	5	NURS406y	Intensive Nursing Practicum	44	0	0	25	69	0	69	Passed
ولاد فرح خليفة	5	NURS406y	Intensive Nursing Practicum	56	0	0	26	82	0	82	Passed
بشاري مسعود عبد السلام محمد	4	NURS406y	Intensive Nursing Practicum	41	0	0	19	60	0	60	Passed
يوسف عبدالرفيع عبد المودود عبدالله	4	NURS406y	Intensive Nursing Practicum	14	0	0	17	31	31	31	Failed
أحمد عبدالرفيع بلعصب عبدالودود	4	NURS406y	Intensive Nursing Practicum	0	0	0	17	17	60	60	Passed
كاشفة محمد عثمان فضل	4	NURS406y	Intensive Nursing Practicum	49	0	0	18	67	0	67	Passed
رفيف هادي محمد عثمان سالم	4	NURS406y	Intensive Nursing Practicum	6	0	0	19	25	26	26	Failed
أحمد اسامع مسعود حويش	4	NURS406y	Intensive Nursing Practicum	52	0	0	21	73	0	73	Passed
إيمان عبدالرسول انور احمد	4	NURS406y	Intensive Nursing Practicum	44	0	0	18	62	0	62	Passed
رفيف محمد فرح أريكة	4	NURS406y	Intensive Nursing Practicum	51	0	0	21	72	0	72	Passed

Figure 19: Datasheet View of 4th year students of 2nd semester school year 2016-2017 from TUCON-GSv2

At the commencement of Libyan Civil war in 2011 the school attendance was postponed, to catch up with the school calendar after the war, the length of the semester was shortened from the regular 16 weeks down to 10 weeks. Even when the semester length was adjusted it was still only at 12 weeks or so. The University decided to remove the midterm exam for Colleges offering semester programs so there will be only one major exam, the final exam. The equivalent percentage for midterm and final exam were combined as the new final exam mark.

3.4 Maintenance and System Upgrade

To maintain smooth system performance, periodical maintenance and system upgrade together with several tests was performed. To ensure data integrity collaboration with clinical instructors and several authorities were performed. Most changes occurred when the curriculum was changed but was easily adjusted to fit the current program through the help of clinical instructors. The TUCON-GSv2 being the latest version had withstood the test of time. Holding

more than 32 thousand records and transaction, the system remained steadfast. Main database were stored in the registrar's office and a backup copy were periodically placed in a flash drive.

3.5 Data Mining Research

In 2014 partial records of then OMUCON-GSv1 were used as a study population for a Data Mining research by the authors. Recorded data were helpful in educational data mining as unknown and hidden data patterns of all courses. Specifically records from Nursing Informatics course were used as a predictor for student's overall academic performance. Records were extracted and analyzed using the same database grading system now known as TUCON-GSv2. Introductory database management system methods and implementations like tables, queries, report, and pivot were used to present data, the system and the research generated valuable findings and performed according to needs. The system lived up to its expectation in storage and retrieval of data. Mining elements including extraction, analysis and presentation were performed and simplified by using query, filtering, pivot table and pivot chart. [7]

Generally the TUCON-GSv2 as it is now can generate helpful and meaningful data as it promoted simple educational data mining. The system serves as a vital element in the improvement of quality education for the College of Nursing in Tobruk University, Libya.

4. REPORT GENERATION of TUCON-GSv2

The main requirement of the Tobruk University College of Nursing administration is that the new system would generate the same tabular format they have from the old system (Figure 2). The format of the report must be retained to accommodate the request. Using the new database for recording of data and then calling a procedure to generate the same database in spreadsheet format becomes the solution.

The example code below (Source Code 1) was used to call and open Microsoft Excel and displaying it in the appropriate worksheet with a pre-made template for every year level and department selected in the main menu (shown on Figure 8).

```
Dim oExcel As Object
Dim oBook As Object
Dim oSheet As Object
Set oExcel = CreateObject("Excel.Application")
'cheat block>
If cmblevel.Text = "1" Then
Set oBook = oExcel.Workbooks.Open(App.Path & "\" & "generator\" & sy & "-" & sem & "\temps\Book1.xls")
Elseif cmblevel.Text = "2" Then
Set oBook = oExcel.Workbooks.Open(App.Path & "\" & "generator\" & sy & "-" & sem & "\temps\Book2.xls")
'new 3rd year
Elseif cmblevel.Text = "3" And DataCmbgroup.Text = "" Then
Set oBook = oExcel.Workbooks.Open(App.Path & "\" & "generator\" & sy & "-" & sem & "\temps\Book3.xls")
'old 3rd year
Elseif cmblevel.Text = "3" And DataCmbgroup.Text = "Anesthesia" Then
Set oBook = oExcel.Workbooks.Open(App.Path & "\" & "generator\" & sy & "-" & sem & "\temps\Book3.xls")

'new 4th year
Elseif cmblevel.Text = "4" And DataCmbgroup.Text = "" Then
Set oBook = oExcel.Workbooks.Open(App.Path & "\" & "generator\" & sy & "-" & sem & "\temps\Book4.xls")

Set oSheet = oBook.Worksheets(1)
Adodc1.Refresh
If Not Adodc1.Recordset.EOF Then
oExcel.Visible = True ' Show the excel sheet
End If
```

Source Code (1)

The number of subjects per semester is less than 10, since all course subjects will be displayed in column, selected fields from the database will also be the columnar title. Number of units was also concatenated to the subject in column field hence the use of trim command in VB. The

code below (Source Code 2) also displays in the report title based on selected school year level and semester.

```
Dim describe(10)
Dim dis
'subjects and units display

Do Until Adodc2.Recordset.EOF
For k = 5 To Adodc1.Recordset.Fields.Count
If Trim(Adodc2.Recordset.Fields(1).Value) = Trim(Adodc1.Recordset.Fields(k - 1).Name) Then
describe(dis) = Adodc2.Recordset.Fields(6).Value
oExcel.ActiveSheet.Cells(5, k + 1).Value = fsub & "(" & funits & ")"
dis = dis + 1
End If
Next
Adodc2.Recordset.MoveNext
Loop
oExcel.ActiveSheet.Cells(4, 3).Value = xtitle
```

Source Code (2)

The number of student for every page of worksheet was set to 15, it will be displayed using the same file so loop command was added to aid copying the cell template. Every page must have title and logo so the College logo was also duplicated in every page. (Source Code 3)

```
Set k = Nothing

' copy cell template
counters1 = Adodc1.Recordset.RecordCount / 15
'insert new logo
If counters1 > 1 Then
oExcel.ActiveSheet.Pictures.Insert (App.Path & "\" & "logonursing.jpg")
oExcel.ActiveSheet.Shapes(2).IncrementTop (715)
oExcel.ActiveSheet.Shapes(2).IncrementLeft (-80)
End If
If counters1 > Adodc1.Recordset.RecordCount \ 15 Then
counters1 = counters1 + 1
End If
For s = 1 To counters1 - 1
r1 = s * 25 + 1
r2 = r1 + 24
r3 = s * 25 + 5

oBook.Worksheets("sheet1").Range("a1:s25").Copy Destination:=oBook.Worksheets("sheet1").Range("a" & r1 & ":" & r2)

'duplicate logo
oExcel.ActiveSheet.Shapes(s + 1).Duplicate
oExcel.ActiveSheet.Shapes(s + 2).IncrementTop (660)
oExcel.ActiveSheet.Shapes(s + 2).IncrementLeft (10)

oExcel.ActiveSheet.Shapes(s + 1).ScaleHeight 0.7, msfalse

Next
'delete spare logo
If s > 1 Then
oExcel.ActiveSheet.Shapes(s + 1).Delete
End If
```

Source Code (3)

The students mark was displayed in tabular format; since students' grade was displayed as a group instead of individual marks the code below was used. In most instances the number of subjects is less than 10 so unused columns must be hidden, the number of students is not always divisible by 15 so succeeding unused rows must also be hidden. To protect the new worksheet from any alteration the sheet was locked after generation of report. (Source Code 4)

```
NxtLine = 7
counters = 1
'display student grades
'For dis = 1 To 10
Do Until Adodc1.Recordset.EOF
For lc = 5 To Adodc1.Recordset.Fields.Count
'number increment
If lc - 2 = 3 Then
oExcel.ActiveSheet.Cells(NxtLine, lc - 2).Value = counters
End If
'name
If lc - 1 = 4 Then
oExcel.ActiveSheet.Cells(NxtLine, lc - 1).Value = Adodc1.Recordset.Fields(lc - 4)
End If
```

```
'control no
If lc = 5 Then
    oExcel.ActiveSheet.Cells(NxtLine, lc).Value = Adodc1.Recordset.Fields(lc - 5)
End If
'grades
If Adodc1.Recordset.Fields(lc - 1).Value < 0 Then
    oExcel.ActiveSheet.Cells(NxtLine, lc + 1).Value = "A"
Else
    oExcel.ActiveSheet.Cells(NxtLine, lc + 1).Value = Adodc1.Recordset.Fields(lc - 1)
End If
Next
Adodc1.Recordset.MoveNext
NxtLine = NxtLine + 1
counters = counters + 1
jumper = (NxtLine + 3) Mod 25
If jumper = 0 Then
    NxtLine = NxtLine + 10
End If
Loop
'Next
'cheat: combine and hide duplicate columns
If oExcel.ActiveSheet.Cells(5, 6).Value = oExcel.ActiveSheet.Cells(5, 7).Value Then
    oExcel.ActiveSheet.Columns(6).Hidden = True

If oExcel.ActiveSheet.Cells(5, 8).Value = oExcel.ActiveSheet.Cells(5, 9).Value Then
    oExcel.ActiveSheet.Columns(8).Hidden = True
End If
'hide blank columns and rows
For hiderc = 7 To 15
    If oExcel.ActiveSheet.Cells(5, hiderc).Value = "" Then
        oExcel.ActiveSheet.Columns(hiderc).Hidden = True
    End If
Next
For hiderr = NxtLine To r2 - 4
    oExcel.ActiveSheet.Rows(hiderr).Hidden = True
Next

If NxtLine < 22 Then
    For hiderr = NxtLine To 21
        oExcel.ActiveSheet.Rows(hiderr).Hidden = True
    Next
End If
oBook.SaveAs "C:\users\jameshack45\desktop\Book2.xls"
oExcel.ActiveCell.Worksheet.Cells(10, 4).Locked = False
' Then protect the whole sheet by using a password.
oExcel.ActiveCell.Worksheet.Protect "jnbm", False, True, True, False

oExcel.Quit
'Close the connection
Adodc1.Recordset.Close
Adodc1.Refresh
Adodc2.Refresh
```

Source Code (4)

The following code (Source Code 5) was part of a sub procedure of print command; the code labels the school year level and semester of the generated query.

```
If cmblevel.Text = "1" Then
    forprinting = "1styear" & sem & sy
    xtitle = "1st Final Examination - 1st Year " & semd & " " & syd
    sycode = "y1" & semc
Elseif cmblevel.Text = "2" Then
    forprinting = "2ndyear" & sem & sy
    xtitle = "1st Final Examination - 2nd Year " & semd & " " & syd
    sycode = "y2" & semc
```

Source Code (5)

Finally an SQL code was needed to select the fields to display in the data control and the report generated in the worksheet. (Source Code 6)

```
SELECT stud_info.[Control No], stud_info.Stud_Name, stud_info.Level, stud_records.Course_code, Subject_tb.Subject, stud_records.Midterm,
stud_records.Lab, stud_records.Finals, IIf([lab_units]>0,[Midterm]+[Lab]+[finals],[midterm]+[finals]) AS Grade, stud_records.[2nd],
IIf([2nd]=0,[grade],IIf([lab_units]>0,[2nd]+[lab],[2nd])) AS [Final Grade], IIf([Final grade]>=50 And ([description]='Minor Subject') Or [final grade]>=50
And [description]='') Or ([grade]>=60 And [description]='Major Subject'),'Passed','Failed') AS status, stud_info.[List No]

FROM (stud_info INNER JOIN stud_records ON stud_info.[Control No] = stud_records.[Control No]) INNER JOIN Subject_tb ON
stud_records.Course_code = Subject_tb.Course_code where (((stud_records.code)="" & sycode & "")And ((stud_records.sy)="" & sy & "")) And
((stud_records.sem)="" & semcode & ""))"

ORDER BY stud_info.Level, Subject_tb.Subject, stud_info.[List No];"
```

Source Code (6)

Select statement was used to choose the fields to be displayed in the report. Computation for [Grade], [2nd] and Final Grade and determining if the subject is a major or minor course is also included.

Inner Join statement was used to combine the appropriate tables and was arranged by an Order By clause based on students [level], [subject] and [List No] to sort in ascending order.

5. CONCLUSION

Tobruk University College of Nursing Grading System version 2 performed generally well as a Database System for the College. Having the system eases up encoding, collecting of records, organizing and sorting for data retrieval, and report generation. The system is unique in its design as the reports were retained from the old system but recording was in the new database system instead. The study presented the operational aspects of the College of Nursing in Tobruk University in terms of grading of nursing students together with the use of TUCON-GSv2 and history of its predecessors using actual archived reports. Portion of the actual source code was also presented to address the report generation requirement of the College. The system promotes not only the use of Database Management system and data mining but promotes the whole Nursing program in Tobruk University as well, being one of the few Colleges using a systematic record handling of data in Libyan Universities. The TUCON-GSv2 can also generate useful data and turn it to a meaningful one to promote educational data mining and improving quality education.

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ACKNOWLEDGEMENT / SOURCE OF SUPPORT

The authors would like to thank first and foremost God Almighty for the grace and glory of His name, giving us the gift of wisdom and inspiration to write this study. We acknowledge our family specially our mothers and also our friends, for their unwavering support. And to the publisher for the insight in promoting research development, thank you and God bless us all.