

DESIGN OF RLE SCORER WEB FORMS AND NURSING STUDENTS EFFICACY IN PARENTERAL DRUG ADMIN AT TOBRUK UNIVERSITY

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ABSTRACT

Related Learning Experience or RLE is a course offered in Tobruk University College of Nursing for 1st year and 2nd year students to prepare them for actual scenario in the hospital by practising skills related to Nursing and Health care. Team teaching is used to perform this activity and evaluated by Return Demonstration in the laboratory class and once more in the Final Return Demonstration or final exam. Tabulating all procedures and steps is a tedious matter doing it manually. In this study the proponents designed an RLE Scorer web forms based on Google survey forms to collect students performance and to computer for their equivalent marks. The focus of the study is in RLE 3 or parenteral drug administration. The collected data was saved in the Google drive and downloaded later; the results were treated statistically to find the mean score in all 5 procedures of RLE 3, and to find the difference between male and female respondents and the difference of variance based on rating. It was shown that the students performed generally well reaching the passing mark. The male students fared better in all procedures compared to female but there was no significant difference established. The purpose of the study is to encourage technological adaptation in collecting performances of nursing students, promoting team teaching in training of nursing skills in RLE thus supporting quality nursing education and nursing informatics.

KEYWORDS

Nursing Informatics, Related Learning Experience, Parenteral Drug Administration, Computer

1. INTRODUCTION

Nursing students recognize the significance of team teaching, practical return demonstration, and hospital exposure towards excellent clinical nursing practice [1]. Proper nursing care for patients needs intensive practice [2]. Appropriate management of medication is an essential aspect of nursing practice to avoid problems or complication with the patients [3, 4]. Continuous experiences of the student nurses' in a variety of practical learning strategies is an effective means of acquiring needed skills set to increasing knowledge, skills, attitude and values to become an excellent nurse practitioner [1]. In team teaching all assigned teachers actively share the instruction of content and skills to their students, they also accept equal responsibility for the education of all students and are dynamically involved throughout the class period [5]. For the improvement in their performance in the hospital students must be exposed to practical demonstration in the classroom laboratory [6]. Students would be able to apply things learned at school in real situation or hospital scenario and able to exercise the procedure they performed in the laboratory [7]. The advantage of using team teaching strategy includes: having various teaching styles and activities presented to the learners, and having more time for one on one and small group instruction [8]. The strategies of team teaching are having a group of teachers who

work together in planning, conducting and evaluating the learning activities for the same group of learners or to put it simply a team work between two qualified instructors together making presentations to the class [1]. Teachers using the said approach should prepare and plan to stimulate student in learning experience [9]. In Tobruk University this is performed in RLE or Related Learning Experience, a course offered for 1st and 2nd year students for 4 semesters where they were trained before doing clinical practice in their higher year and hospital scenario. If the Practical Return Demonstration demonstrated by the clinical instructor on the procedure in nursing laboratory is followed up with return demonstration of the nursing students, it would emphasize greater understanding to the purpose and responsibility of a nurse on why taking care of the patient is important [1].

RLE 3 is a course offered in the 1st semester of 2nd year class in College of Nursing, Tobruk University. The focus of this course is parenteral drug administration also known as injection using a needle and a syringe [2]. There are 5 main procedure the student must master to finish the course; withdrawing medication from a vial, withdrawing medication from ampule, intradermal injection, intramuscular injection and subcutaneous injection. Procedures followed in these skills were adapted from Delmar's [2]. An intradermal injection is a method used to administer medications just below the skin, given for slow absorption of potent medication due to the less richly supplied blood vessels of this layer [2]. Intramuscular injection is a method used to administer medications into the deep muscle tissue for the purpose of quick absorption due to the richly supplied blood vessels in the muscle [11, 12]. A subcutaneous injection is a method used to administer medications into the loose connective tissues just below the dermis of the skin, given especially if medications do not need to be absorbed as quickly as those given intramuscularly due to the less richly supplied blood vessels in the subcutaneous tissue [2]. Before injection was to be administered to patients, the students or practitioners must withdraw medication from a vial or ampoules. Vials are often used to package multi-dose or single-dose parenteral medication; it is a small glass bottle with a rubber seal at the top [2]. Ampoules (also spelled ampule) are containers that hold a single dose of medication; it was made of clear glass and have a distinctive shape with a constricted neck [2]. Currently to assess the students the clinical instructor uses a checklist of procedures, rating every step from 3 as highest score and 0 as the lowest. Then it was tallied to get a sum, divide it to the number of items to get performance grade for each skill. All 5 procedures will then be computed for its average, done manually by clinical instructors. A time consuming process considering the number of students to assess during return demonstration in the classroom and in their final return demonstration considered as their final exam.

The adoption of Electronic Health Records has increased in recent years so is technological advancement in any field. Discrete data elements are more widely available which can be leveraged for secondary use [13]. The term eHealth by definition is defined as "the cost-effective and secure use of information and communication technologies in support of health and health-related fields, including healthcare services, health surveillance, health education, knowledge and research" [14]. The goal of eHealth is to improve the cooperation and coordination of healthcare, in order to improve the quality of care and reduce the cost of care at the same time [15]. The definition and purpose of e-health can be adapted in the students' evaluation in RLE where performance can be encoded electronically. To make development easier, efficient and portable the use of Google Docs, Google Sheets, and Google Slides were being utilized by developers. These Google suits are a word processor, a spreadsheet and a presentation program respectively, all part of a free, web-based software office suite offered by Google within its Google Drive service. The three apps are available as web application, and as mobile apps for Android and iOS [16] were developers can take advantage of mobile-computing. To create the survey forms Google forms will be used by the researchers. Google forms is a tool that allows collecting information from users via a personalized survey or quiz, the information is then

collected and automatically connected to a spreadsheet where it is populated with the survey and quiz responses [17]. Certainly, 'mobility' is a characteristic of a mobile computing environment where the user is able to continue his/her work seamlessly wherever he/she is [18].

In this study the researchers designed a simple RLE scorer web forms with the ability to collect the data in the cloud to be used for computation of the students return demonstration evaluation. Since it is both a web and mobile app, the evaluators can use their smart phones and tablets for data recording online. The assigned tabulator will just export the data collected in a spreadsheet for easy computation. The recorded scores would then be treated statistically to find the average score, standard deviation and adjectival rating. To test the difference of the mean score between male and female students an independent t-test and p-value would be computed. To test the difference of variance between the students rating, ANOVA will be utilized. The main purpose of the application is to ease the recording and computation by doing it electronically thus encouraging technological adaptation. The objective in the collection of results is to present and analyse the actual performance of the students' in common parenteral drug preparation and administration. The app and data collection would be limited for RLE 3, 2nd year students of College of Nursing in Tobruk University. The result of the study is also intended to promote Nursing Informatics.

2. MATERIALS AND METHODS

The research uses experimental design on the web app and a descriptive non-experimental design for analysis of respondent performance in RLE 3 procedure's drug administration. Population assessment respondents will be the 2nd year students of Related Nursing Experience 3 of College of Nursing. The study used the return demonstration procedure used in their final practical exam. The study aims to find out the nursing student's performance on parenteral drug administration and employ the RLE 3 Scorer Web Forms as evaluation tool on classroom performance and exams at Tobruk University.

2.1 Study Population

The respondents consisted of 55 nursing students who recently took RLE 3 course from 2nd year. The whole 2nd year class who attended the classroom and laboratory activities including the final exam was utilized in the study. To determine their current efficacy the study will present their performance in the return demonstration exam.

2.2 Research Tools/Instrument

The researcher uses a clinical instructor made procedure currently used as a checklist/evaluation tool for RLE 3 class which focuses on parenteral drug administration. There are 5 procedure being used, withdrawing medication from a vial, and withdrawing medication from ampule, intradermal injection, intramuscular injection and subcutaneous injection.

2.3 Data Measures

To permit ease of analysis collected data were tallied and organized into tables. Frequency distribution is used to count the number of respondents on the equivalent rating. Measures of central tendency like weighted mean and standard deviation were used to look for variation in the relative contribution of individual data values to the mean. Independent t-test was used to compare the means of perception between male and female students. ANOVA was used to get the difference in the variance when grouped according to rating.

The computed results are then analysed with the use of an interpretation with specific mean score ranges and a subsequent adjectival interpretation. Shown below is the interpretation used for study in terms of nursing student's efficacy in parenteral drug administration.

Table 1: Interpretation of student's efficacy in Parenteral Drug Administration

Range	Adjectival Interpretation
90 - 100	Excellent
80 - 89	Very Good
70 - 79	Good
60 - 69	Passed
50 - 59	Needs Improvement
Below 50	Poor

2.4 Development Technique

The proponent utilized a cloud based development approach in the creation of the RLE Scorer Web Forms based on NPL or Non- Procedural Language techniques. Google forms were used in the development of checklist/procedure for data collection. 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 [19].

2.5 Software Tools

The researchers used RLE web Forms to collect the data, exporting the result as a CSV file then attaching it to a ready made tally sheet in spreadsheet format permitting the data to be computed using sum, average for mean score, stdev for standard deviation sample size. Tallied values undergone data analysis tool pack to get the difference of mean between the gender of students by computing for t-test and p value.

3. RLE SCORER WEB FORMS

Student performance were recorded and extracted in RLE Scorer web forms, figures will be used to present the screen shot of the system during operation. Manual computation method will also be presented descriptively.

3.1 Manual Computation

Related Learning Experience is a course offered for Bachelor's of Science in Nursing at Tobruk University for 1st year and 2nd year. There are four RLE's, RLE 1 and RLE 2 for 1st year, RLE 3 and RLE 4 for 2nd year. The grading system composed of class attendance and quizzes for 20%, laboratory return demonstration 40% and final return demonstration (final exam) at 40%. Both return demonstration (laboratory and final exam) activity uses the same set of checklist or procedures. There are 5 skills set to be evaluated in RLE 3, withdrawing medication from a vial, and withdrawing medication from ampule, intradermal injection, intramuscular injection and subcutaneous injection. All skill sets follow several steps and the clinical instructor evaluates the student giving 3 points as the highest score for every step performed properly in one procedure. The number of steps for every procedure and the number of procedures for every RLE class varies. All points acquired for every step will be tallied and will become their raw score in the

procedure; the raw score will be divided to number of items multiplied by 100 to get the procedure score. All 5 procedures will be tallied to get the average, 40% will be taken from the average to get the equivalent grade. Procedures in the laboratory class were usually performed one at a time, but during the final exam all procedures must be performed at once rotating with assigned evaluators. Equivalent grades were computed manually.

Table 2: Example Computation per Procedure

Procedure 1	Score
Step 1	3
Step 2	2
.	
.	
Step 12	2
Total (Raw Score)	24
Number of Items	12(steps)*3 = 36
Grade for the Procedure	$27/36 \times 100 = 75$

In table 2 a sample computation for a procedure is presented. Depending on the number of steps students will be given certain score for it then tallied as their raw score. Grade for the procedure will be treated by dividing the raw score to the number of items multiplied by 100. This will be the grade of the student for the procedure.

Table 3: Example Return Demonstration Grade

Skills	Grade
Intradermal injection	75
Withdrawing medication from a vial	94
Intramuscular injection	60
Withdrawing medication from ampoule	85
Subcutaneous injection	70
Total	384
Average	$384/5 = 77$ (rounded off)
Equivalent grade for Return Demonstration	40% of 77 = 31

Table 3 shows what the clinical instructor will do or the assigned tabulator during the final exam to compute for the grade of the students in return demonstration which consist a total of 80% of the final grade of the students in the subject; that is 40% in laboratory and 40% in final exam. This is a tedious process because of the number of students to be evaluated most especially during the final exam where the students will do all 5 procedures in the same scheduled date.

3.2 RLE Scorer

To address the manual computation of the students' grade, an RLE scorer web forms application was developed. It is based on the Google survey forms and collected data will also be saved in the cloud using Google drive. The app is a simple web based program so it is accessible anywhere through smart phones and tablets for it is designed for android and iOS format. The data will be used for the recording of students' performance in RLE 3 or parenteral drug administration.

RLE Scorer 3A
WITHDRAWING MEDICATION FROM AN AMPULE

* Required

Control No. *

YOUR ANSWER

1. Check the medication in Doctor's order , expiration date printed on ampule. *
2. Wash hands. *
3. Tap the stem of the ampule or twist wrist quickly while holding the ampule vertically.
4. Wrap a small gauze or dry alcohol swab around the neck of the ampule. *
5. Break off the top of the ampule along the pre scored line using a snapping motion. Always break away from the body. *
6. Remove the cap from the needle by pulling it straight off. *
7. Withdraw the medication and the amount to be administered: a. Insert the tip of the needle into the ampule, careful not to touch the rim which is upright on a flat surface. b. Insert the tip of the needle into the ampule and invert the ampule. Keep the needle at the center and not touching the sides of the ampule. *
8. Do not expel any bubbles that may form in the solution. Wait until the needle has been withdrawn and expel air carefully. *
9. Cap the needle and discard the ampule at the container. *
10. Wash your hands *

Submit

Never submit passwords through Google Forms.

Figure 1: Sample screen of RLE 3AScorer – Withdrawing Medication from ampule

Figure 1 is a sample screen in a smart phone of the RLE 3A Scorer, specifically to tabulate for withdrawing medication from ampule. The user will share the form to a team of clinical instructors that then will access the system through their phones or tablets. The clinical instructor will input the students control number for collection purposes. Then for every step numbered from 1 to 10 for the said skill, user will evaluate the students based on their ability to perform the steps, 3 will be the highest score and 0 as the lowest. The procedure steps was set to required fields to make sure every step was evaluated, then at the end the clinical instructor will click the submit button. All collected data will then be exported in the cloud. At the moment the system is designed for online use, so internet connectivity is a must.

QUESTIONS RESPONSES 5

5 responses

SUMMARY INDIVIDUAL

Control No.

5 responses

- 123
- 1234
- 2010101
- 1257
- 1

Get email notifications for new responses

Select response destination

Unlink form

Download responses (.csv)

Print all responses

Delete all responses

Figure 2: Downloading Collected Survey/performance

Figure 2 shows the downloading procedure of collected responses of student performance. It is accessed in the cloud through Google drive. The assigned tabulator will download response in the computer and will be saved as CSV format. Since the data is in spreadsheet form the computation will be easily adopted.

	A	B	C	D	E	F	G	H	I	J	K	L	M	V	W
1	Timestamp	Control No.	1. Check t	2. Wash h	3. Tap the	4. Wrap a	5. Break o	6. Remove	7. Withdr	8. Do not	9. Cap the	10. Wash your hands	Total	Average	
2	2018/01/1	2015859	2	2	3	2	1	2	3	3	3	3	24	80	
3	2018/01/1	20161063	1	3	2	1	3	3	2	2	3	3	23	77	
4	2018/01/1	2016929	2	1	3	1	1	2	1	2	1	3	17	57	
5	2018/01/1	2016946	1	1	1	1	1	1	1	1	1	1	10	33	
6	2018/01/1	2016960	3	2	3	2	1	2	1	2	1	3	20	67	
7	2018/01/1	2016966	3	2	2	1	2	2	2	2	2	3	21	70	
8	2018/01/1	2016971	3	3	3	2	3	2	3	2	2	3	26	87	
9	2018/01/1	2016989	3	3	2	1	3	3	2	2	3	3	25	83	
10	2018/01/1	2016994	2	2	2	1	1	2	1	1	1	2	15	50	
11	2018/01/1	20161012	2	3	2	1	3	3	2	2	3	3	24	80	

Figure 3: DownloadedResponse(Performance in Withdrawing Medication from ampule)

The downloaded user response is shown in figure 3, Timestamp, Control No. and Steps 1 – 10 where the collected response saved in Google drive. The researcher created a template to compute for the Total and Average shown in column V and W. The average will be the grade of the student in the said procedure. Same steps will be used for the rest of the procedures. There are 6 worksheets for this file, the 5 procedures and the tabulation of all procedures to be shown in Figure 4.

	A	B	C	D	E	F	G	H	I	J
1	No.	Control	3A	3B	3C	3D	3E	Total	Average	Equivalent
2	1	2015859	80	33	52	61	64	290	58.00	23
3	2	20161063	77	81	37	92	72	359	71.73	29
4	3	2016929	57	56	56	72	64	305	60.93	24
5	4	2016946	33	44	52	64	39	232	46.47	19
6	5	2016960	67	63	74	81	78	363	72.53	29
7	6	2016966	70	37	55	58	88	308	61.60	25
8	7	2016971	87	50	33	72	50	292	58.33	23
9	8	2016989	83	54	46	72	22	277	55.47	22
10	9	2016994	50	54	57	69	78	308	61.60	25
11	10	20161012	80	35	33	67	64	279	55.80	22

Figure 4: Computed Performance in all Procedures

Column 3A to 3B as shown in figure 4 is linked from the 5 procedure worksheet, so the data was presented per procedure. Total column will compute for the summary of the 5 procedures, Average column for the mean and Equivalent as 40% of the Average. The Equivalent column will be the students' grade for the Return Demonstration. All excel formula was preformatted as a template for easier organization and computation. The RLE Scorer web form is adaptable to both laboratory return demonstration and final exam. For this research the result of the final exam was used, collected data will then be used for statistical analysis of students' efficacy in parenteral drug administration.

4. RESULTS AND DISCUSSION

Collected data by the RLE scorer web forms were structured using table to permit ease of investigation. Frequency distribution, measures of central tendency like weighted mean and standard deviation were presented together with equivalent adjectival rating for the student's

efficacy in parenteral drug administration. For comparison of data between male and female student independent t-test and p value were used.

4.1 Frequency Distribution of Respondents

Table 4: Frequency Distribution of Students Rating in Parenteral Drug Administration

Rating	f	%
Very Good (80 – 89)	12	21.82
Good (70 – 79)	14	25.45
Passed (60 – 69)	16	29.09
Needs Improvement (50 – 59)	8	14.55
Poor (Below 50)	5	9.09
Total	55	100

The final return demonstration of 2nd year students of 1st semester school year 2017-2018 frequency of rating is shown in Table 4. A total of 55 students took the exam and 12 of them performed Very Good, 14 performed Good, and 16 reached Passing mark. 8 students Needs Improvement and barely missed the passing mark and 5 performed poorly. Since this data is only 40% of their final grade, results may differ after adding the other 60%. Since the purpose of this study is efficacy of students, final exam which is more formal as a performance result was used.

4.2 Weighted Mean of Respondents

Table 5: Weighted Mean of Students Efficacy in Parenteral Drug Administration

Procedure	WM	SD	Adjectival Rating
Intradermal injection	59.96	13.45	Passed
Withdrawing medication from ampoule	61.40	17.82	Passed
Subcutaneous injection	76.93	15.09	Good
Withdrawing medication from a vial	70.13	17.41	Good
Intramuscular injection	70.98	18.87	Good
Overall Performance	67.88	12.43	Passed

As shown in Table 3 the student performed well in Subcutaneous injection procedure with a mean score of 76.93 rated as Good. The same goes with Intramuscular injection and withdrawing medication from a vial with 70.98 and 70.13 respectively with adjectival rating of Good. In withdrawing medication from ampoule the mean score is at 61.40 or Passed and barely making at the passing mark rounded off is Intradermal injection at 59.96. The overall performance is equivalent to 67.88 or right at the passing mark. The rating indicates that the students are good enough to perform the procedure but may need more practice since all procedures are sensitive and might affect patient care. The students will need more exercises to push the result higher. The clinical instructor may focus more on the students' weak points to get a better result and prep the students more before they go to hospital duty the next school year. The continuous experiences of the student nurses' in a variety of practical learning strategies is proven to be an effective

means of acquiring needed skills set to increasing knowledge, skills, attitude and values to become an excellent nurse practitioner [1].

4.3 Differences in Responses

Table 6: Differences in Responses between Male and Female students

Procedure	Gender	WM	SD	t-stat	p value
Intradermal injection	Male	61.20	10.98	0.3729	0.7142
	Female	59.69	14.03		
Withdrawing medication from ampoule	Male	69.20	20.25	1.3637	0.1916
	Female	59.67	17.00		
Subcutaneous injection	Male	81.90	15.63	1.3865	0.1846
	Female	75.82	11.78		
Withdrawing medication from a vial	Male	72.90	20.91	0.4761	0.6404
	Female	69.51	16.75		
Intramuscular injection	Male	72.40	27.44	0.1904	0.8514
	Female	70.67	16.80		
Overall Performance	Male	71.52	14.23	0.9101	0.3763
	Female	67.07	12.02		

The mean of male 2nd year students in all procedures differs slightly higher in all procedures, where overall performance is at 71.52 for male compared to Female's 67.07 mean score, although a t-stat value of 0.9101 and p value of 0.3763 where it signify no significant difference in mean. Procedure withdrawing medication from ampoule recorded the highest difference in mean were male students' has 69.20 compared to the females 59.67 mean score, though a high standard deviation of 20.25 for male caused the t-stat value at 1.3637 and p-value of 0.1916 or signifying no significant difference in the mean score. Statistically based on p value the biggest difference is in Subcutaneous injection at 0.1846 although results show no significant difference in the mean. This mean that both male and female students of 2nd year class in Tobruk University performed statistically the same in RLE 3 parenteral drug administration.

Table 7: Differences in Variance Grouped according to Rating

Procedure	Rating	WM	Variance	F-value	p < 0.05
Overall Performance	Very Good	82.68	5.01	236.0789	0.0000
	Good	74.89	5.53		
	Passed	64.86	10.63		
	Needs Improvement	55.20	9.63		
	Poor	42.68	16.41		

Table 7 shows the difference in variance when grouped according to rating. The students with poor performance tends to have the highest variance while the upper group very good have the lowest. With an F-value of 236.0798 and p value below 0.05 level of confidence, the statistics resulted in a significant difference when grouped according to rating.

5. CONCLUSION

RLE Scorer Web Form is a simple web form that can be operated in computers and mobile device. It performed generally well as a data collector and evaluator of student's drug administration performance using handheld devices and internet connection. Having the system

eases up encoding, collecting of records, organizing and sorting, data retrieval, and report generation. The system is an easy to develop tool for data retrievable in the cloud. The study presented the operational aspects of the College of Nursing in Tobruk University in terms of grading/evaluating nursing students in their return demonstration. The system promotes development of Google forms in data collection and evaluation, an easier method of student grading with automatic computation, Health Informatics and Nursing program in Tobruk University for incorporating new trends in handling data. The statistical results shows that the students performed generally well in parenteral drug administration with a passing mark of 67.88 although no significant difference were seen when students were grouped according to gender. The variance proved to be significantly different based on ANOVA when the students are grouped according to rating. The collected data may be used to improve quality of nursing education by enhancing student's weak points through proper and extensive training and complementing their strong area in the area of parenteral drug administration. The learning of students will be essential when they proceed to actual hospital scenario.

The researchers recommend further study to address factors that may affect the result. More respondents and including other School year level in the study for comparison purposes would advance the result. It is suggested that the faculty members ensure adequate training and proper education in Related Learning Experience. In terms of the web forms, it would be better if all RLE course and procedures will be adapted, data collection in offline mode to avert problems during internet signal loss and/or for the University institution to provide for a stronger internet connection.

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