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The Dental Information Management System: Its Implications to Policy Formulation for Dental Education

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Abstract

This study deals with the development of dental information management system for dentistry students by acquiring the basic knowledge and skills that they may use in clinical practice. Applying Schank's and his associates' theory on goal-based scenarios which is a learn-by-doing simulation approach, the researcher designed a course with different scenarios ended with a dental information management system as a final output. Respondents who assessed the course include computer faculty members, dentistry graduates and undergraduates. The top five basic knowledge skills in designing dental information management system were identified while all the scenarios in building database were perceived as much needed in the course. As a result, formulation of policy was proposed for domains that include basic knowledge and skills; practice management and patient care, and; professional development. All the respondents conform that the eight scenarios are important in designing dental information management system. The proposed policies do expand the use of computer applications and technology toward competency-based dental education programs.

Keywords: dental information management system; policy formulation; dentistry; and dental education

Introduction

The goal of World Health Organization (WHO) is "to establish oral health information systems for sharing experiences on chronic diseases and common risk factors as well as to monitor oral health status worldwide" ("Oral Health Information Systems," n.d.).

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Data such as oral manifestations of HIV/AIDS, oral cancer, and oral diseases are being addressed by the Global Infobase system that processes information for dissemination among Ministries of Health on country level.

Calonge (2011) stated that since oral disease continues to be a serious public health problem in the Philippines with 92.4% of Filipinos having tooth decay and 78% having gum disease, the Department of Health (DOH) has committed to improve existing dental information management system and development of IT system for recording dental health service accomplishments.

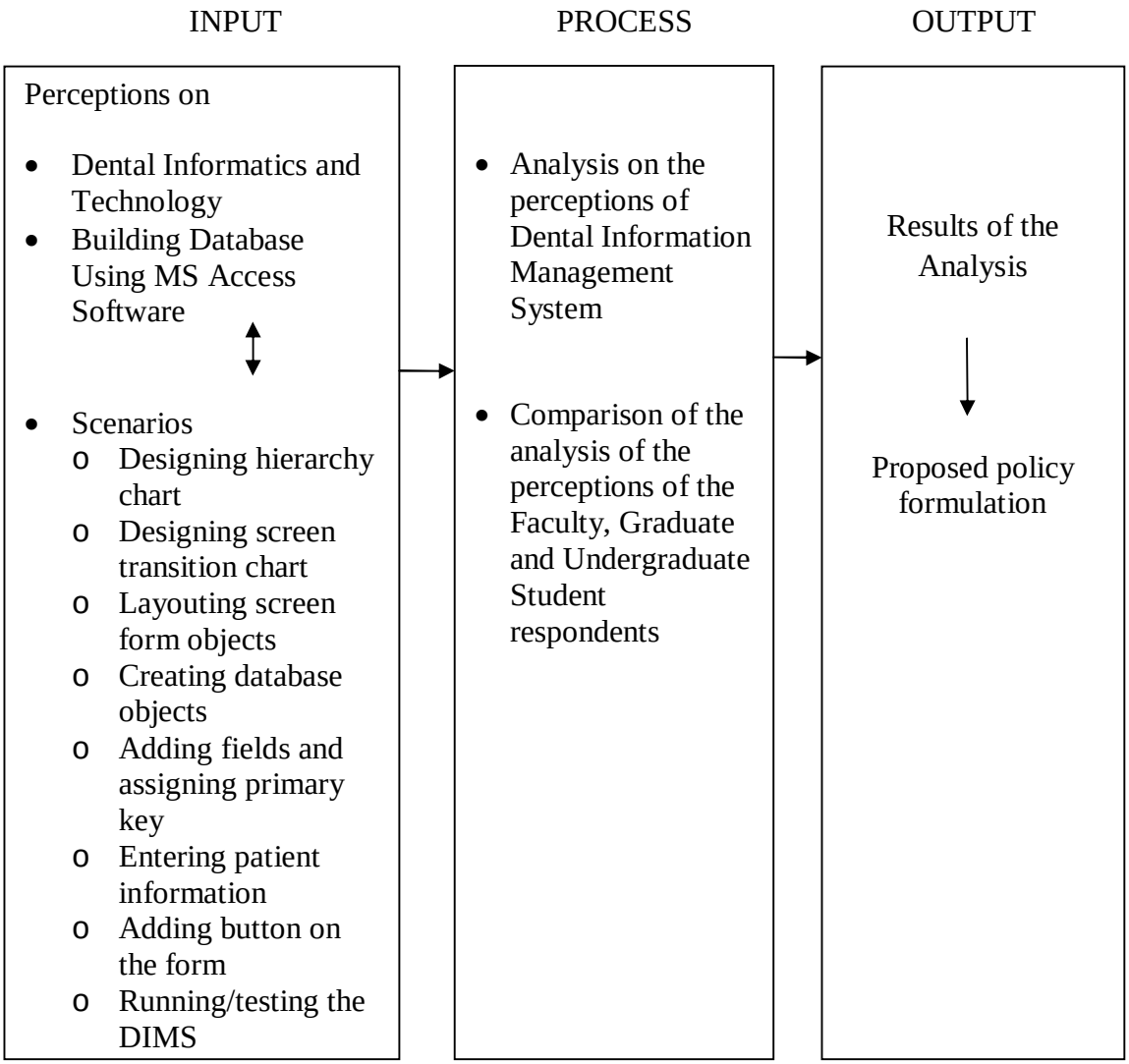
A survey report by Schleyer, Thyvalikakath, Spallek, Torres-Urquidy, Hernandez, and Yuhaniak (2006), stated that 80% of all dental practices in the U.S. use dental practice management systems while 70% of the dental offices use clinical software application like digitized dental imaging. Moreover, Atkinson, Zeller and Shah (2002) had mentioned in an article that many patient information system packages are available in the market; however, these commercial software packages have deficiencies and none can respond to all the needs of a large dental school clinic. Hobdell, Petersen, Clarkson and Johnson (2003) mentioned that data must be in a form that can be exported easily to the next generation of software, as systems outdate quickly.

Considering the facts mentioned above and realizing the tasks of dental hygienists and practitioners within a dental office, this study describes that the academic environment is the place to begin a learning process for developing and utilizing dental management systems. The school is the ground where dentistry students can acquire a level of skill and where they can integrate their first-hand experience from their school trainings which they can give a better judgment on the usefulness and functionality of a software system.

This study aims to assess and compare the perceptions of the computer faculty members, graduates and undergraduates of dentistry in Centro Escolar University. The researcher modified the course incorporating the basic knowledge and skills as well as scenarios toward the development of a dental information management system (DIMS) as a learning output. The perceptions of the three-group respondents served as the basis in the formulation of the proposed policy. Figure 1 shows the research paradigm illustrating the development of an output subject for evaluation by the teachers and students.

Figure 1.

A Research Paradigm Showing the "Perception on Dental Information Management System as a Basis of Proposed Policy Formulation"



Literature Review

According to Hawkins, Young, Hubert and Hallock (2012), information systems should facilitate the creation of searchable, measurable collections of data for the tracking and improvement of outcomes and performance.

If the data manager and the database user have input into the design of the information system, there is a greater probability of high accuracy, quality, and usability of the collected data. According to Hobdell et. al. (2003), if the eventual users of an information system have zero input, the result of such system will not meet user needs and will eventually fail.

The objective of the study by Song, Spallek, Polk, Schleyer and Wali (2009) was to identify general dentists' information needs and the information sources they use to meet those needs in clinical settings. This is to construct the design of dental information systems. The research concluded that dentists have various information needs at the point of care and recommended that for future development of dental information or clinical decision-support systems, developers should consider integrating high-quality, up-to-date clinical evidence into comprehensive and easily accessible electronic data records (EDRs).

Research Methodology

Validation of the Questionnaire

Three separate tests were run for the teachers, students and for overall perceptions of the respondents which all showed very high reliability or "excellent". Table 1 shows that all items in all areas such as Dental Informatics and Technology, Building Database Using MS Access, and Scenarios showed above 0.90 reliability rate in both teachers' and students' perceptions which means that no revisions were done on the 80-item of the questionnaire .

Table 1: Reliability Statistics of the Teachers' and Students' Responses on the Questionnaire

Areas	Number of Items	Cronbach's Alpha
Dental Informatics and Technology	39	.9884
Building Database Using MS Access	33	.9883
Scenarios	8	.9883
Total	**80**	**.9883**

Table 1 shows that Dental Informatics and Technology with 39 items has a Cronbach's alpha of 0.9884; Building Database Using MS Access with 33 items has a Cronbach's alpha of 0.9883; and, Scenarios with 8 items has a Cronbach's alpha of 0.9883. Overall, the 80-item questionnaire yielded a Cronbach's alpha of 0.9883 which is greater than 0.9 critical levels. Hence, all the items in the questionnaire are **excellent** based on the perceptions of all the respondents.

The respondents used for the reliability test were not included in the final assessment of this study. The new compositions of new respondents were indicated in Table 2.

Table 2: Respondents of the Study

Respondents	Frequency	Percentage
Faculty	21	13.46
Graduate	39	25.00
Undergraduate	96	61.54
Total	**156**	**100.00**

Statistical Treatment of Data

The researcher treated and analyzed the data statistically based on the statement of the problems using the following methods:

1. Mean for assessing the perceptions and comparison of the three group respondents on the basic knowledge and skills
2. Ranking method for sorting data giving positional weight of the questions
3. Pearson correlation to determine the relationship of knowledge and skills with the scenarios based on the perceptions of the respondents
4. Likert scale as shown in Table 3 was used to interpret the mean

Table 3: Likert Scale for Mean Interpretation

Scale	Mean Interval	Verbal Interpretation (VI)
5	4.50 – 5.00	Very much needed (VMN)
4	3.50 – 4.49	Much needed (MN)
3	2.50 – 3.49	Needed (N)
2	1.50 – 2.49	Slightly needed (SN)
1	1.00 – 1.49	Not needed (NN)

Perceptions on Dental Information Management System

It was mentioned above that the mean was used to compare the perceptions of the three-group respondents while the standard deviation was employed to measure confidence in the statistical conclusions.

The ranking method, on the other hand, was utilized to identify the top five, the middle five, and the bottom five for items in Unit 1- Dental Informatics and Technology showing the basic knowledge and Unit 2 – Building Database Using MS Access Software showing the basic skills as perceived by the respondents.

Perceptions on Basic Knowledge

The perceptions of the faculty, graduate and undergraduate respondents and the summary of perceptions on the basic knowledge are presented in Table 4. The mean was used to assess the basic knowledge and skills based on the five-point scale as seen in Table 3, while the total values of which was divided by the number of respondents to compute for the average.

Table 4 shows the 39 basic knowledge under Unit 1- Dental Informatics and Technology which were numbered as they appear on the survey questionnaire, and the perception of faculty, graduates, and undergraduate student respondents on each item represented by the mean with corresponding rank and verbal interpretation.

Table 4: Basic Knowledge in Designing Dental Information Management System

Basic Knowledge	Faculty				Graduate				Undergraduate				Overall			
Unit I. Dental Informatics and Technology	**Mean**	**SD**	**Rank**	**VI**	**Mean**	**SD**	**Rank**	**VI**	**Mean**	**SD**	**Rank**	**VI**	**Mean**	**SD**	**Rank**	**VI**
1. Introduction to Dental Informatics	4.48	0.81	1	MN	4.13	0.86	5.5	MN	4.0	1.08	4	MN	4.10	1.00	2	MN
2. Definition of dental informatics	4.29	1.01	5	MN	4.05	0.83	11.5	MN	3.91	1.07	8.5	MN	4.00	1.01	5.5	MN
. Dental informatics vs. information technology	4.43	0.87	2	MN	3.90	0.82	25	MN	3.78	1.07	26.5	MN	3.90	0.93	16	MN
4. Types of problems dental informatics solve	4.38	0.86	3	MN	4.21	0.86	1.5	MN	3.93	0.96	7	MN	4.06	0.89	4	MN
5. Research areas addressed by dental informatics: dental practice, dental research, dental education and dental management	4.33	0.80	4	MN	4.21	0.73	1.5	MN	4.03	0.97	2.5	MN	4.12	0.94	1	MN
6. Relevance of dental informatics to dentist in private practice	4.19	0.87	6.5	MN	4.13	0.83	5.5	MN	4.03	1.0	2.5	MN	4.08	1.00	3	MN
7. Human Interface technology : Graphical User Interface (GUI)	4.19	0.81	6.5	MN	3.85	1.14	30	MN	3.67	0.96	36	MN	3.78	0.99	32.5	MN
8. Interface designs	4.05	0.74	13	MN	3.72	1.21	38.5	MN	3.81	0.94	23.5	MN	3.82	0.97	23	MN
9. Screen design	4.05	0.74	13	MN	3.95	1.19	20.5	MN	3.96	0.93	5	MN	3.97	0.97	7.5	MN
10. Form design	4.10	0.77	10	MN	4.03	1.14	15	MN	3.91	0.94	8.5	MN	3.96	0.98	9.5	MN
11. Web design	4.10	0.83	10	MN	4.10	1.02	7	MN	3.90	0.99	10.5	MN	3.97	0.96	7.5	MN
12. Universal design	4.14	0.85	8	MN	4.08	1.04	8.5	MN	3.85	0.95	16.5	MN	3.95	0.96	12	MN
13. Multimedia Technology	4.10	0.83	10	MN	4.03	0.96	15	MN	3.89	0.99	12.5	MN	3.95	0.94	12	MN
14. Types of Multimedia	3.90	0.77	16	MN	3.92	0.87	23.5	MN	3.86	1.00	15	MN	3.88	0.98	17.5	MN
15. Static images	3.81	0.81	27	MN	3.79	0.86	35.5	MN	3.76	1.06	28.5	MN	3.78	1.07	32.5	MN
16. Video	3.86	1.06	21	MN	3.87	0.89	26.5	MN	3.73	1.15	31.5	MN	3.78	1.05	32.5	MN
17. Audio	3.86	0.96	21	MN	3.72	0.92	38.5	MN	3.73	1.12	31.5	MN	3.74	0.98	36.5	MN
3. Compression and decompression of information	4.05	0.80	13	MN	3.92	0.98	23.5	MN	3.65	0.99	37	MN	3.77	0.94	35	MN
19. Multimedia application	3.95	0.86	16	MN	3.77	0.96	37	MN	3.83	0.96	19.5	MN	3.83	0.96	21	MN
20. Graphics processing : Color presentation, Image quality, Graphics software	3.81	0.98	27	MN	3.95	1.02	20.5	MN	4.06	0.93	1	MN	4.00	0.92	5.5	MN

21. Multimedia technology application : Computer graphics (CG)	3.81	0.93	27	MN	3.82	0.82	33.5	MN	3.89	0.96	12.5	MN	3.86	1.02	20	MN
22. Virtual reality (VR)	3.71	0.96	34	MN	3.97	0.90	17.5	MN	3.64	1.05	38	MN	3.73	1.06	38	MN
23. Computer simulation	3.95	0.86	16	MN	3.97	0.99	17.5	MN	3.71	1.12	34	MN	3.81	1.06	26	MN
24. Computer aided design (CAD)	3.52	1.08	39	MN	4.05	1.05	11.5	MN	3.75	1.06	30	MN	3.79	0.98	29.5	MN
25. What is database?	3.86	0.96	21	MN	4.08	0.84	8.5	MN	3.85	1.04	16.5	MN	3.91	1.00	15	MN
26. Database architecture	3.81	0.87	27	MN	3.87	1.00	26.5	MN	3.78	1.04	26.5	MN	3.81	0.99	26	MN
27. Characteristics of databases	3.67	0.91	37	MN	3.95	0.92	20.5	MN	3.76	1.04	28.5	MN	3.79	0.99	29.5	MN
28. Database models	3.76	0.94	31.5	MN	3.79	0.86	35.5	MN	3.72	1.05	33	MN	3.74	1.01	36.5	MN
29. Relational database	3.71	0.96	34	MN	4.03	0.84	15	MN	3.70	1.07	35	MN	3.78	1.00	32.5	MN
30. Network database	3.86	1.01	21	MN	3.82	0.79	33.5	MN	3.61	1.06	39	MN	3.70	1.00	39	MN
31. Hierarchical database	3.71	1.01	34	MN	3.85	0.90	30	MN	3.80	1.03	25	MN	3.80	1.03	28	MN
32. Database Management System	3.95	1.02	16	MN	4.15	0.96	4	MN	3.84	1.06	18	MN	3.94	0.97	14	MN
33. Database design	3.81	1.12	27	MN	3.85	0.90	30	MN	3.81	0.98	23.5	MN	3.82	1.00	23	MN
34. Data analysis	3.81	0.98	27	MN	4.05	1.0	11.5	MN	3.83	1.00	19.5	MN	3.88	1.03	17.5	MN
35. Data design	3.67	0.91	37	MN	3.85	1.09	30	MN	3.82	1.03	21.5	MN	3.81	0.94	26	MN
36. Data manipulation	3.81	0.81	27	MN	4.05	0.89	11.5	MN	3.94	0.99	6	MN	3.95	1.01	12	MN
37. Relational operation	3.67	0.86	37	MN	3.95	0.94	20.5	MN	3.88	1.07	14	MN	3.87	1.03	19	MN
38. Set operation	3.76	0.83	31.5	MN	3.85	0.96	30	MN	3.82	1.10	21.5	MN	3.82	1.01	23	MN
39. Three types of data relationships : One-to-many, Many-to-many, One-to-one	3.86	0.91	29	MN	4.18	0.91	3	MN	3.90	1.06	10.5	MN	3.96	**0.73**	9.5	MN
OVERALL	**3.94**	**0.64**		**MN**	**3.96**	**0.71**		**MN**	**3.83**	**0.77**		**MN**	**3.88**	**1.00**		**MN**

It can be seen in Table 4 that *Research areas addressed by dental informatics: dental practice, dental research, dental education and dental management* ranks **1** with a mean of **4.12**; rank **2** is *Introduction to Dental Informatics* with a mean of **4.10**; rank **3** is *Relevance of dental informatics to dentist in private practice* with a mean of **4.08**; rank 4 is *Types of problems dental informatics solve* with a mean of **4.06**; and tie rank in **5.5** is *Definition of dental informatics* and *Graphics processing: color presentation, image quality, graphics software* with a mean of **4.0**. All top five have **much needed** in the basic knowledge in designing dental information management system.

In the middle ranks, *Types of multimedia* and *Data analysis* have tied ranks of **17.5** with a mean of **3.88**. Rank **19** is *Relational operation* with a mean of **3.87**. Rank **20** is *Multimedia technology application: Computer graphics (CG)* with a mean of **3.86**, and ranking in **21** is *Multimedia application* with a mean of **3.83** and with **much needed** as perceived by the respondents.

In the bottom five ranks, garnering rank **35** is *Compression and decompression of information* with a mean of **3.77**; tied ranks in **36.5** are *Audio* and *Database models* with a mean of **3.74** each; rank **38** is *Virtual reality (VR)* with a mean of **3.73**; and, finally, the lowest rank is 39 goes with to *Network database*. All ranks got a verbal interpretation of **much needed** as responded by faculty, graduates and undergraduates.

In view of the above data, the overall perception of the respondents yielded a mean of **3.88** which is **much needed** in basic knowledge in designing dental information management system. It can be concluded that both the faculty and the graduates, including the undergraduates have the same judgment on the cognitive aspect of the dental informatics course. Also, it can be gleaned that all the respondents perceive and agree that knowledge relating to dental informatics are the topmost important requisites in the learning process.

Perceptions on Basic Skills

Table 5 exhibits the 33 basic skills under Unit 2- Building Database Using MS Access which were numbered as they appear on the survey questionnaire, and the perceptions of faculty, graduates, and undergraduate student respondents on each item represented by the mean with corresponding ranks and verbal interpretations.

Table 5: Basic Skills in Designing Dental Information Management System

Basic Skills	Faculty				Graduate				Undergraduate				Overall			
Unit 2. Building Database Using MS Access Software	Mean	SD	Rank	VI	Mean	SD	Rank	VI	Mean	SD	Rank	VI	Mean	SD	Rank	VI
. Introduction to MS Access	3.81	0.93	28.5	MN	4.18	1.00	4	MN	3.98	1.08	8.5	MN	4.01	1.04	6	MN
. Create a new database	3.95	0.86	10.5	MN	4.21	0.86	3	MN	3.96	1.04	11	MN	4.02	0.97	3.5	MN
. Create tables for entry in design view	3.86	0.85	23	MN	4.15	0.84	5.5	MN	3.93	1.03	16	MN	3.97	0.96	12	MN
. Use, understand, and set data types : Text, Memo, Number, Currency, Date/Time, AutoNumber, Yes/No, Lookup Wizard	3.90	0.94	18	MN	4.15	0.96	5.5	MN	4.02	1.03	2	MN	4.04	1.00	1	MN
. Create and delete primary key	3.86	0.96	23	MN	4.10	0.91	8	MN	4.00	0.99	6	MN	4.01	0.97	6	MN
. Create a query	4.05	0.86	1.5	MN	4.03	0.93	11.5	MN	3.98	1.01	8.5	MN	4.00	0.96	8	MN
. Sort fields in a query	4.00	0.89	4.5	MN	3.92	1.01	21	MN	3.93	0.97	16	MN	3.94	0.96	14.5	MN
. Show fields in a query	4.00	0.89	4.5	MN	3.855	1.04	27	MN	3.92	1.06	18	MN	3.91	1.03	18.5	MN
. Run a query using wildcards	3.95	0.80	10.5	MN	3.95	1.05	17.5	MN	3.91	1.03	19.5	MN	3.92	1.01	16.5	MN
. Run a query for fields not in result	4.05	0.86	1.5	MN	3.77	1.04	32	MN	3.90	1.05	21.5	MN	3.88	1.02	24.5	MN
. Run a query for a number value	3.95	0.80	10.5	MN	3.95	1.05	17.5	MN	3.85	1.04	25.5	MN	3.89	1.01	22	MN
. Run a query using the comparison criteria "And"	4.00	0.84	4.5	MN	3.74	1.04	33	MN	3.91	1.03	19.5	MN	3.88	1.01	24.5	MN
. Run a query using the comparison criteria "Or"	4.00	0.84	4.5	MN	3.90	1.07	23.5	MN	3.84	1.03	28	MN	3.88	1.01	24.5	MN
. Create a Form using the Wizard tool	3.81	0.81	28.5	MN	3.87	0.92	25.5	MN	3.97	1.00	10	MN	3.92	0.96	16.5	MN
. Understand the basics of the Toolbox : Controls	3.90	0.83	18	MN	4.08	0.90	9	MN	4.01	1.01	4	MN	4.01	0.96	6	MN
. Insert a graphic/image	3.95	0.86	10.5	MN	4.26	0.91	1	MN	3.94	1.00	13	MN	4.02	0.97	3.5	MN
. Insert an unbound object frame	3.81	0.98	28.5	MN	3.85	0.90	29.5	MN	3.94	1.00	13	MN	3.90	0.97	20.5	MN
. Resize an image/graphic	3.81	1.03	28.5	MN	3.95	0.92	17.5	MN	3.84	1.03	28	MN	3.87	1.00	28	MN
. Import a table	3.95	0.9	10.5	M	4.23	0.9	2	M	3.90	1.0	21.5	M	3.99	1.0	9.5	M

from Excel		7		N		0		N		7		N		2		N
. Import data from a delimited text file	3.71	0.85	33	MN	4.00	0.97	13	MN	3.82	1.08	31	MN	3.85	1.02	32	MN
. Export an Access file to Excel	3.81	0.93	28.5	MN	4.05	0.89	10	MN	3.81	1.06	33	MN	3.87	1.00	28	MN
. Understand the purpose of aggregate functions	3.81	0.81	28.5	MN	3.90	1.05	23.5	MN	3.84	1.00	28	MN	3.85	0.98	32	MN
. Create and run a query using Count	3.95	0.92	10.5	MN	3.85	1.14	29.5	MN	3.82	1.03	31	MN	3.85	1.04	32	MN
. Create a run a query using Average	3.95	0.92	10.5	MN	3.97	1.09	14.5	MN	3.88	0.98	24	MN	3.91	0.99	18.5	MN
. Create and run a query using the parameter "Between"	3.90	0.77	18	MN	3.92	1.06	21	MN	3.82	1.02	31	MN	3.86	0.99	30	MN
. Creating new Form object from scratch	3.90	0.77	18	MN	3.85	1.16	29.5	MN	3.89	1.03	23	MN	3.88	1.03	24.5	MN
. Use AutoForm to create a form based on a standard layout	3.90	0.83	18	MN	3.87	1.06	25.5	MN	3.85	0.95	25.5	MN	3.87	0.96	28	MN
. Use the Form Wizard	3.81	0.93	28.5	MN	4.13	0.80	7	MN	4.04	1.01	1	MN	4.03	0.95	2	MN
. Modify the Form object in Design View	3.95	0.86	10.5	MN	3.95	0.97	17.5	MN	4.01	0.98	4	MN	3.99	0.96	9.5	MN
. Use AutoReport to create a form based on a standard layout	3.86	0.85	23	MN	3.97	0.84	14.5	MN	3.94	0.96	13	MN	3.94	0.91	14.5	MN
. Create a report using Report Wizard	3.81	0.93	28.5	MN	4.03	0.87	11.5	MN	3.99	0.99	7	MN	3.97	0.95	12	MN
. Modify a report in Design View	3.90	0.83	18	MN	3.92	0.91	21	MN	4.01	1.04	4	MN	3.97	0.98	12	MN
. Create a report completely from scratch using the Design View tools	3.90	0.83	18	MN	3.85	0.84	29.5	MN	3.93	1.01	16	MN	3.90	0.95	20.5	MN
OVERALL	**3.90**	**0.81**		**MN**	**3.98**	**0.74**		**MN**	**3.92**	**0.87**		**MN**	**3.93**	**0.83**		**MN**

The Table 5 shows that all the basic skills were perceived as **much needed** and there is no mean value lower than **3.85**. There are several tied ranks on the summary skills table which started from rank 1 to 32. The last row of the table shows the overall perception.

Rank **1** from top five highest mean is the basic skill *Use, understand, and set data types: Text, Memo, Number, Currency, Date/Time, AutoNumber, Yes/No, Lookup Wizard* with a mean of **4.04** and **much needed** verbal interpretation. Rank **2** is *Use the Form Wizard* with second to the highest mean of **4.03** and **much needed** verbal interpretation. Tied rank of **3.5** with a mean of **4.02** for skills *Create a new database* and *Insert a graphic/image* which is **much needed**. Tied ranked of **6** with a mean of **4.01** which is **much needed** are basic skills *Introduction to MS Access*; *Create and delete primary key*; and *Understand the basics of the Toolbox: Controls*.

In the middle ranks, tied ranks of **14.5** are basic skills *Sort fields in a query* and *Use AutoReport to create a form based on the standard layout* with a mean of **3.94** which is **much needed**. Another tied ranks of **16.5** with a mean of **3.92** between *Run a query using wildcards* and *Create a Form using the Wizard tool*. Both are perceived as **much needed** based on scale. Another tied rank of **18.5** with a mean of **3.91** which is **much needed** are *Show fields in a query* and *Create and run a query using Average*.

In the bottom ranks, tied ranks of **28** with a mean of **3.87** which is **much needed** are *Resize and image/graphic*; *Export an Access file to Excel* and *Use AutoForm to create a form based on a standard layout*. Rank **30** with a mean of **3.86** which is **much needed** is basic skill *Create and run a query using the parameter 'Between'*. Basic skills with tied ranks of **32** and a mean of **3.85** which is much needed are *Import data from a delimited text file*; *Understand the purpose of aggregate functions*; and, *Create and run a query using Count*.

The summary perceptions of all the respondents have resulted to an overall mean of **3.93** which means **much needed**. The summary table indicates that no basic skill has been perceived as needed, slightly needed or even not needed. The respondents' perceptions vary only on the values of mean per skill but not on its verbal interpretation which they all agree that all the skills listed on the survey are **much needed**.

Perceptions on Scenarios

The scenarios are presented in Tables 6 to 13 distinctively to show how the perceptions of the faculty, graduate and undergraduate respondents can be compared with one from the other.

Scenario 1. Designing a Visual Hierarchy Chart Based on Oral Diagnosis Form Used by the School of Dentistry

Table 6: Designing Visual Hierarchy Chart as Scenario

Respondent	Mean	SD	Verbal Interpretation
Faculty	4.33	0.73	MN
Graduate	4.33	0.93	MN
Undergraduate	4.03	0.95	MN
Composite Mean	**4.15**	**0.92**	**MN**

It can be seen from Table 6 that faculty and graduate respondents have the same mean of **4.33** which is **much needed** and standard deviation is **0.73** for faculty and **0.93** for graduate. On the other hand, the perception of the undergraduates has a mean of **4.03** which is **much needed** and a standard deviation of **0.95**.

It is concluded that both faculty and graduate respondents have the same perception with regard to designing visual hierarchy as scenario, while the perception of the undergraduate has a difference of 0.30 between the mean values of faculty and graduate. The overall mean of **4.15** means the perception on designing visual hierarchy chart as scenario is **much needed** in learning designing dental information management system as responded by faculty, graduates and undergraduate.

Scenario 2. Designing a Screen Transition Chart Based on the Hierarchy Chart to Indicate the Flow from One Screen to the Next

Table 7 presents the designing screen transition chart as scenario for faculty, graduate and undergraduate respondents.

Table 7: Designing Screen Transition Chart as Scenario

Respondent	Mean	SD	Verbal Interpretation
Faculty	4.19	0.87	MN
Graduate	4.31	0.98	MN
Undergraduate	4.03	0.89	MN
Composite Mean	**4.12**	**0.91**	**MN**

The table shows that the graduate has the highest mean of **4.31** which is **much needed.** This is followed by faculty with a mean of **4.19** and undergraduates with a mean of **4.03**. Both faculty and undergraduate respondents have a verbal interpretation of **much needed**.

It can be deduced from the table that only the graduate respondents perceived the scenario as **much needed** because of their familiarity with the oral diagnosis form and exposure to clinical procedures. This experience had helped them decide what data and information to incorporate when designing the screen transition chart. On the other hand, the faculty may have the expertise about designing the chart but they may not have the same experience the graduate had. Also, the undergraduate respondents may have the idea of designing the chart but not as realistic as what the graduate respondents had experienced. The overall mean of **4.12** means that the perception on designing screen transition chart as scenario is **much needed** in learning designing dental information management system.

Scenario 3. Lay outing the Screen Form Objects Such as Text Boxes, Buttons, Images and Labels Manually on Each Form

Table 8 below presents the layout screen form objects as scenario for faculty, graduate and undergraduate respondents.

Table 8: Lay outing Screen Form Objects as Scenario

Respondent	Mean	SD	Verbal Interpretation
Faculty	4.43	0.75	MN
Graduate	4.49	0.82	MN
Undergraduate	4.03	0.90	MN
Composite Mean	**4.20**	**0.88**	**MN**

The table shows that the graduate respondents gave the highest perception with a mean of **4.49** which is **much needed**, followed by faculty with a mean of **4.43** which is also **much needed** and undergraduate with a mean of **4.03** with verbal interpretation of **much needed**.

It can be gleaned from the table that both faculty and graduate respondents agree on the scenario as **much needed**. This scenario calls for the student's ability to organize or arrange the form objects such as text boxes, buttons and images based on the importance and flow of data that may go with those objects. However, the undergraduate respondents may not have the same perception but may have the realization that such scenario is **much needed**. The overall mean of **4.20** indicates that the perception on layout screen form objects as scenario is **much needed** in learning designing dental information management system.

Scenario 4. Creating the Database Objects: Tables, Queries, Forms and Reports Using MS Access Program

Table 9 presents the creating database objects as scenario for faculty, graduate and undergraduate respondents.

Table 9: Creating Database Objects as Scenario

Respondent	Mean	SD	Verbal Interpretation
Faculty	4.29	0.78	MN
Graduate	4.36	0.84	MN
Undergraduate	4.19	0.91	MN
Composite Mean	**4.24**	**0.88**	**MN**

It can be seen from the table that graduate respondents have the highest mean of **4.36** which is **much needed**, followed by faculty with a mean of **4.29** which is **much needed**, and third by undergraduate respondents with a mean of **4.19** which is **much needed**.

Once again, both faculty and graduate respondents share the same degree of perception that creating database objects as scenario is **much needed**. This scenario is the highlight in designing dental information management system. It calls for creating tables which is the main structure and storage of a database. Other objects such as queries which provide a way of extracting information from a database based on certain criteria. The forms are used for data entry or data viewing while reports provide summary and presentation of data.

The graduates may have an idea how important patient information is before arriving to a conclusion or diagnosis. The unexposed undergraduates to clinical situations may rely on stock knowledge, past experience or third hand information. The faculty may only guide the students in creating database and put emphasis on output and evaluation. Nevertheless, the faculty, graduate and undergraduate respondents have an overall mean of **4.24** which means that creating database objects as scenario is **much needed** in learning designing dental information management system.

Scenario 5. Adding Fields and Assigning Primary Key on Database Tables Based on Oral Diagnosis Form.

Table 10 on the next page presents adding fields and assigning primary key on database tables as scenario for faculty, graduate and undergraduate respondents.

Table 10: Adding Fields and Assigning Primary Key on Database Tables as Scenario

Respondent	Mean	SD	Verbal Interpretation
Faculty	4.33	0.80	MN
Graduate	4.39	0.85	MN
Undergraduate	4.06	0.96	MN
Composite Mean	**4.18**	**0.92**	**MN**

As shown on the table, the graduate respondents indicate the highest mean of **4.39** which is **much needed**; followed by faculty with a mean of **4.33** which is **much needed**; and the undergraduate reveals a mean of **4.06** with a verbal interpretation of **much needed**.

It can be deduced from the table that the scenario of adding fields and assigning primary key database tables was perceived by graduate and faculty with same intense. The graduates find it having a close relation to actual need because the scenario calls for using the Oral Diagnosis (OD) form used by School of Dentistry as basis for adding fields. The undergraduates might just presume that the OD form was just another requirement in their major course.

The faculty may have realized the importance of transforming the OD form into dental information management system. However, the three groups of respondents have an overall mean of **4.18** which is **much needed** in learning designing dental information management system.

Scenario 6. Entering Actual or Fictitious Patient Information Using Form Object

Table 11 presents entering patient information using form object as scenario for faculty, graduate and undergraduate respondents.

Table 11: Entering Patient Information Using Form Object as Scenario

Respondent	Mean	SD	Verbal Interpretation
Faculty	4.29	0.78	MN
Graduate	4.41	0.88	MN
Undergraduate	4.11	0.97	MN
Composite Mean	**4.21**	**0.93**	**MN**

As seen on the table, the graduate respondents exhibited another highest mean of **4.41** which is **much needed**. This is followed by faculty with a mean of **4.29** which is also **much needed**. The undergraduates came last with a mean of **4.11** which is **much needed**.

The mean figures show that graduate respondents can relate more with the scenario because of their experience in collecting patient information using the oral diagnosis form which has been their work since 3rd year proper. The undergraduate respondents may not be involved yet in such job but may consider their experience with family dentist as an example. Faculty awareness on the learner's academic background may redirect their teaching techniques. Still, the faculty, graduate and undergraduate respondents' perceptions have an overall mean of **4.21** which is **much needed**.

Scenario 7. Adding Buttons on the Form for Event Action Like Opening Another Form or Exiting an Application. This must follow the transition chart.

Table 12 presents adding buttons on the form for event action as scenario for faculty, graduate and undergraduate respondents.

Table 12: Adding Buttons on the Form for Event Action as Scenario

Respondent	Mean	SD	Verbal Interpretation
Faculty	4.29	0.85	MN
Graduate	4.46	0.91	MN
Undergraduate	4.21	0.89	MN
Composite Mean	**4.28**	**0.89**	**MN**

The table shows a higher perception on the scenario where the graduate respondents show the highest mean value of **4.46** which is **much needed**. This is followed by the faculty respondents with a mean value of **4.29** which is also **much needed** and third is the undergraduate with a mean of **4.21** with the same verbal interpretation of **much needed**.

It can be gleaned from the table that all respondents have the same level of perception based on verbal interpretation with an overall mean of **4.28** which is **much needed**.

Scenario 8. Running / Testing the Dental Information Management System.

Table 13 on the next page presents running and testing the dental information management system as scenario for faculty, graduate and undergraduate respondents.

Table 13: Running / Testing the Dental Information Management System as Scenario

Respondent	Mean	SD	Verbal Interpretation
Faculty	4.33	0.86	MN
Graduate	4.51	0.79	MN
Undergraduate	4.26	0.87	MN
Composite Mean	**4.33**	**0.85**	**MN**

The table shows that the graduate respondents have the highest mean of **4.51**, followed by the faculty with a mean of **4.33** and undergraduate with a mean of **4.26**. All the mean values' verbal interpretation indicate **much needed**.

The perception of faculty, graduate and undergraduate resulted to an overall mean of **4.33** which is **much needed**. This simply implies that running and testing the dental information management system as a scenario is highly recommendable in the learning process of designing dental information management system.

It can be deduced from the eight tables on scenarios for designing dental information management system has proven to be effective. It is related to what goal-based scenario theorist, Schank (1992) had mentioned, that students should learn to apply certain skills in authentic contexts that are related to their interest.

Relationship of knowledge and skills with the scenarios

Table 14 presents the relationship of knowledge and skills with the scenarios while the range scale as shown below was used for data interpretation.

Legend:

Range	**Interpretation**
± 0.00 - ± 0.20	Negligible correlation (NC)
± 0.21 - ± 0.40	Low correlation (LC)
± 0.41 - ± 0.60	Marked correlation (MC)
± 0.61 - ± 0.80	Substantial correlation (SC)
± 0.81 - ± 1.00	High correlation (HC)

Table 14: Relationship of Knowledge and Skills with the Scenarios

Respondent	**Pearson Correlation**	**VI**	**Probability Value**	**Decision**	**Significance**
Faculty	0.791	SC	$\varrho = 0.000 < 0.01$	Reject null hypothesis	Significant
Graduate	0.825	HC	$\varrho = 0.000 < 0.01$	Reject null hypothesis	Significant
Undergraduate	0.791	SC	$\varrho = 0.000 < 0.01$	Reject null hypothesis	Significant
Composite Mean	**0.796**	**SC**	ϱ **= 0.000 < 0.01**	Reject null hypothesis	Significant

< 0.05 S / 0.01 VS
> 0.05 NS

It can be gleaned from the table that faculty respondents had a Pearson correlation of **0.791** with a verbal interpretation of substantial correlation which when treated for probability is **less than 0.01** hence, **null hypothesis** is rejected; as for the Graduate respondents, the Pearson correlation of **0.825** with a verbal interpretation of high correlation which when treated for probability which is **less than 0.01** led to the **rejection of null hypothesis** as well; as for undergraduates, the computed correlation is **0.791**, indicating a substantial correlation, which when treated for probability is less than **0.01** which again led to the rejection of null hypothesis.

The composite mean of **0.796** indicates that the relationship is of **substantial correlation** and the probability which is **less than 0.01** leads to the overall **rejection of the null hypothesis** and therefore, it leads to the **acceptance of the alternative hypothesis** that there is significant correlation among the respondents of the study.

From Table 14, it can be construed that the graduates with Pearson correlation of 0.825, have a "higher appreciation" of the eight scenarios due to the fact that they are applying their knowledge and skills as dental practitioners as compared to the faculty and undergraduate with Pearson correlation of 0.791 for the following reasons:

1) Faculty respondents are not dental practitioners but are proficient in computer software programs; and,
2) Undergraduate respondents have not yet applied their knowledge and skills as dental practitioners.

Perceptions with regard to the eight scenarios in designing dental information management system

Table 15 on the next page presents the perceptions with regard to the eight scenarios in designing dental information management system.

Table 15: Perceptions with Regard to the Eight Scenarios in Designing Dental Information Management System

Scenario	Mean	SD	F-Value	Decisionϱ-value	VI	Decision	Remarks
Designing visual hierarchy chart							
Faculty	4.33	0.73	2.010	ϱ = 0.138 > 0.05	Not Significant	Accept null hypothesis	
Graduate	4.33	0.93					
Undergraduate	4.03	0.95					
Designing screen transition chart							
Faculty	4.19	0.87	1.351	ϱ = 0.262 > 0.05	Not Significant	Accept null hypothesis	
Graduate	4.31	0.98					
Undergraduate	4.03	0.89					
Lay outing screen form objects							
Faculty	4.43	0.75	4.738	ϱ = 0.010 < 0.05	Significant	Reject null hypothesis	Faculty & Graduate T value = 0.75324 Not Significant
Graduate	4.49	0.82					
Undergraduate	4.03	0.90					
Creating database objects							
Faculty	4.29	0.78	0.557	ϱ = 0.574 > 0.05	Not Significant	Accept null hypothesis	
Graduate	4.36	0.84					
Undergraduate	4.19	0.91					
Adding fields and assigning primary key on database tables							
Faculty	4.33	0.80	2.071	ϱ = 0.130 > 0.05	Not Significant	Accept null hypothesis	
Graduate	4.38	0.85					
Undergraduate	4.06	0.96					
Entering patient information using Form object							
Faculty	4.29	0.78	1.489	ϱ = 0.229 > 0.05	Not Significant	Accept null hypothesis	
Graduate	4.41	0.88					
Undergraduate	4.11	0.97					
Adding buttons for event action							
Faculty	4.29	0.85	1.117	ϱ = 0.330 > 0.05	Not Significant	Accept null hypothesis	
Graduate	4.46	0.91					
Undergraduate	4.21	0.89					
Running/Testing dental information management system							
Faculty	4.33	0.86	1.219	ϱ = 0.298 > 0.05	Not Significant	Accept null hypothesis	
Graduate	4.51	0.79					
Undergraduate	4.26	0.87					

It can be seen from the table that **designing visual hierarchy chart** has an F-value of **2.010** yielding a p-value of **0.138** which is greater than **0.05**, thus, it leads to the **acceptance** of the null hypothesis and therefore, it can be said that there is no significant differences on the perceptions of faculty, graduate and undergraduate respondents on the scenario in terms of teaching and learning dental information management system.

The **designing screen transition chart** scenario has obtained an F-value of **1.351** yielding a p-value of **0.262** which is greater than **0.05**, thus, the null hypothesis is **accepted**, and therefore, there are no significant differences on the perceptions of faculty, graduate and undergraduates on the scenario pertaining to teaching and learning dental information management system.

The **layout screen form objects** scenario has recorded an F-value of **4.738** yielding a p-value of **0.010** which is less than **0.05** and therefore, the null hypothesis should be **rejected.** Thus, there are significant differences between the perceptions of the faculty and graduate with the undergraduate respondents in terms of teaching and learning dental information management system. Faculty and graduate respondents find this scenario important because it is a decisive scenario for the dental information management system' interface which sets functions for navigation, storage and retrieval of the information. Undergraduates might have regarded this scenario not so critical due to less experience and less motivation.

The **creating database objects** scenario has garnered an F-value of **0.557** which yields a p-value of **0.574** which is greater than **0.05**, thus, the null hypothesis should be **accepted**; and therefore, there are no significant differences on the perceptions of faculty, graduate and undergraduate in terms of teaching and learning dental information management system.

Meanwhile, the scenario on **adding fields and assigning primary key on database table** has obtained an F-value of **2.071** which yields a p-value of **0.130** which is greater than **0.05**, and therefore the null hypothesis should be **accepted.** Thus, there are no significant differences between the perceptions of faculty, graduate and undergraduate on the scenario as regards teaching and learning dental information management system.

The scenario on **entering patient information using Form object** has recorded an F-value of **1.489** yielding a p-value of **0.229** that is greater than **0.05** and thereby, it leads to the **acceptance** of the null hypothesis. Thus, there are no significant differences between the perceptions of faculty, graduate and undergraduate respondents on the scenario when it comes to teaching and learning dental information management system.

The **adding buttons for event action** scenario, on the other hand, has garnered an F-value of **1.117** which yields a p-value of **0.330** that is greater than **0.05**, therefore, the null hypothesis was **accepted** indicating that there are no significant differences on the perceptions of faculty, graduate and undergraduate respondents on the scenario as regards teaching and learning dental information management system.

The **running/testing dental information management system** scenario has an F-value of **1.219** which yields a p-value of **0.298** which is greater than **0.05**; therefore the null hypothesis should be **accepted**. Therefore, there is no significant difference between the perceptions of faculty, graduate and undergraduate on the scenario in terms of teaching and learning dental information management system.

The **t-value** of **0.75324** between the faculty and graduate respondents indicates that their perceptions are **not significant**.

Formulation of Policies Based on the Results of Study

After the presentation, analysis and interpretation of data, the following policies were formulated as proposal:

Proposed Policy in Integrating Competencies for Dental Education Programs

I. Objective

To expand the use of computer applications and technology toward a competency-based Dental Education programs.

II. Scope

This covers the preparation of a competency-based program for dental education related to the use of computer applications and technology.

III. References

1. Glassman P, Chambers DW. Developing competency systems: a never ending story. J. Dent. Educ 1998; 62(2): 173-182
2. Chambers DW, Glassman P. A primer on competency-based evaluation. J. Dent. Educ 1997; 61(8):651-666
3. Chambers DW, Gerrow JD. Manual for developing and formatting competency statements. J. Dent. Educ 1994;58(5):361-366

IV. Policies

1) The Dean or Academic Department Head shall prepare the proposed competency-based program for dentistry course based on the following domains:
   - Basic Knowledge and Skills - The ability to design and use of computer systems to perform common computing tasks;
   - Practice Management and Patient Care - The use of computer systems to manage patient information and diagnostic patient care; and,
   - Professional Development – The use of computer systems for clinical decision-making.
2) The Dean or Academic Department Head shall consult the Dean of School of Dentistry, dental informatics experts, faculty teaching computer courses and private practitioners regarding the program.
3) The Dean or Academic Department Head shall submit the proposal to the Office of the Academic Affairs.
4) The Office of the Academic Affairs shall review the proposal.
5) Once approved by the Office of the Academic Affairs, the proposal shall be forwarded to the Dean or Academic Department Head for the implementation of the program.
6) The Academic Department Head shall monitor the implementation of the program.
7) The evaluation of the program shall be done after the conduct of the course.

V. Narrative Procedures

Figure 2 summarizes the activities where school authorities are involved.

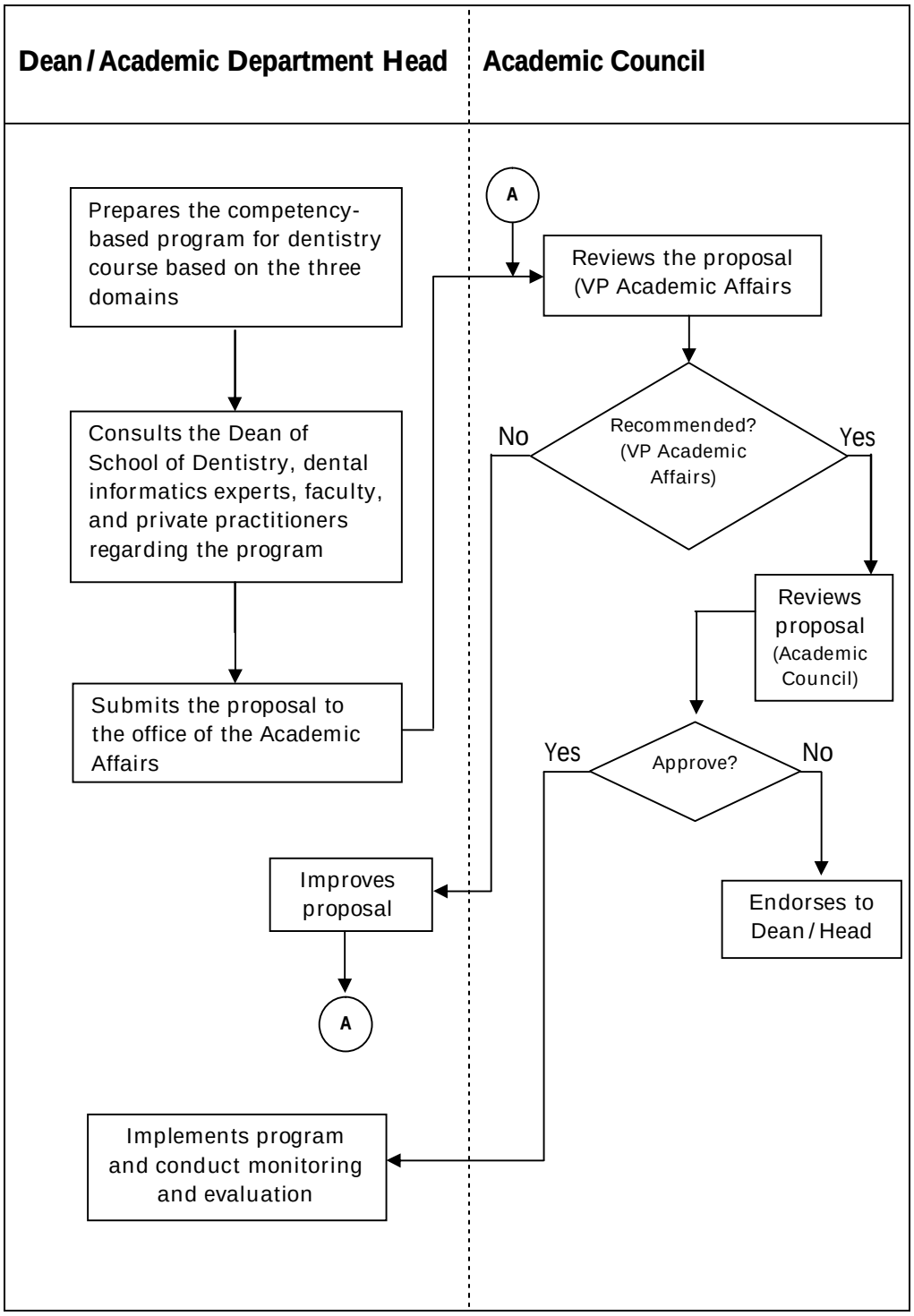
Figure 2: Narrative Procedures

Responsibilities / Authorities	**Activities**
Dean / Academic Department Head	1. Prepares the proposed competency-based program for dentistry course based on the three domains 2. Consults the Dean of School of Dentistry, dental informatics experts, faculty, and private practitioners regarding the program 3. Submits the proposal to the Office of the Academic Affairs
Vice-President for Academic Affairs	4. Reviews the proposal submitted by the Dean / Department Head 5. If disapproved, returns the proposal to Dean / Head to make the necessary revision or changes 6. If approved, returns to the Dean / Head for the implementation of the program
Dean / Academic Department Head	7. Monitors the implementation and evaluates the program after the conduct of its course

VI. Procedure Flowchart

Figure 3 shows the flow of implementation of the proposed policy as executed by the school authorities and academic council.

Figure 3: Procedure Flowchart



Conclusions

Formulation of policy is an endeavor for school authorities responsible for the implementation of an academic course that prepares a learner become more equipped with the knowledge and skills related to his chosen field.

Course designers may apply goal-based scenarios to focus what the teachers want from the students to achieve in terms of the application of knowledge and skills. The scenarios should have specific goals with specific outputs such as developing an information management system in a systematic or hierarchical way. How the components in the in an information system are formed and related by demonstrating the organization of these components to be used for storage, navigation, management and accessibility of data in an information system must be explained as well.

The implication of learning to develop a dental management information system is to review the significance of information systems and face to the challenges on what would be the needed skills to perform for better dental health management program.

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