

Database Modelling For the Expertise of Special Needs Teachers

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Abstract. Special needs school is builds for education practice for special needs children. The teacher must have special qualification with special education. Besides special qualification, teacher for special needs children also get full support by Ministry of Education and Culture for doing their research and service, and certification programs for teacher quality improvement. However, in its application, Ministry of Education and Culture have some problem to get the required teacher's data. To facilitate Ministry of Education and Culture to get the required data, it need an expertise system to accommodate, process, and display the information system of teacher expertise. The design of this expertise system have functional requirements as search system, statistic display process like research statistic, service, and teacher certification, and teacher statistic as a companion. To develop an expertise system, required database design that can meet the needs of the system and accordance to ideal database category. MySQL selected For Database Management System (DBMS). There are some tests for the database design to know if the design already required the needs. The testing done by using query and constraint.

1. Introduction

A data model, called the entity-relationship model, is proposed. This model incorporates some of the important semantic information about the real world [1]. Some related research are discusses about database modelling in Indonesia at education Institution [2 -4]. Research about database modelling has been done previously, but its focus on how the structured concept of data processing [5]. Previous research discuss about sufficient conceptual model and show its relationship to a graph database model [6]. Also focus on integrity constraint [7], modelling functional dependencies [8-9] between entity types [10]. Another research did not discuss about expertise system for teacher data, the research solved media communication problem between teacher and student and how the student be able directly connected to their teacher [11]. The Data modelling and database design have undergone significant evolution in recent years since the domination of business applications by the relational data model and relational database systems [12]. This research aims to make a database modelling to solve problem for students, parents, Ministry of Education and Culture. This database will provide expertise data teacher



for children with special needs. To make sure the database modelling the required needs, the researcher done some test using query and constraint [13].

2. Methodology

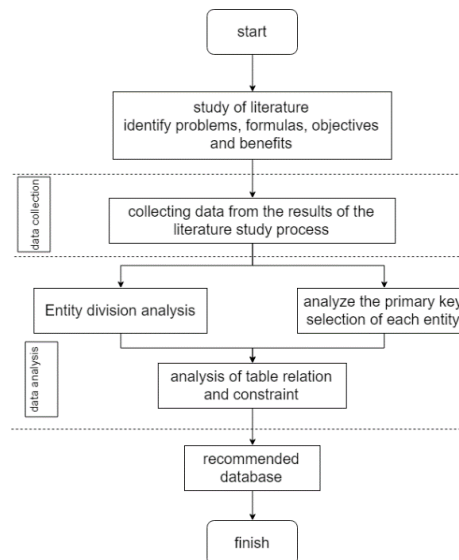


Figure 1. The Research Process Flowchart

2.1. Literature Review

Collect resources for study literature of books, journals, and previous related research result. Then make problem identification, the problem formula, the purpose, and the research benefit.

2.2. Data collection

Collecting data required for research materials and various data from academic data.

2.3. Data Analysis

Analyzing existing data includes the division of entities and the selection of the primary key for each entity. Perform analysis for division entities result and primary key selection. And then mapping the table relation and constraint, which result is a database recommendation.

3. Result and Discussion

Special needs school divide its class and study group based on regulation of Indonesian Education Minister number 10 year 2008, type of disabilities are group into Tunanetra means can't see or blind, Tunarungu means can't hear and/less in hearing or deaf, Tunawicara means can't speak or speech impaired, Tunadaksa means disability, Tunalaras means sound and tone defects or difficult to control emotions and social, Tunagrahita means mind defects, and Tunaganda means people with more than one disability.

As for the number of student in one study group is 5 student for elementary school and 8 student for junior and senior high school based on Minister of Education and Culture regulation clause 24 number 17 year 2017.

3.1. Sitemap

A sitemap provides guidance for visitors to a website who want to know about the website structure and the services provided on that website [15]. This image below shows the design of sitemap:

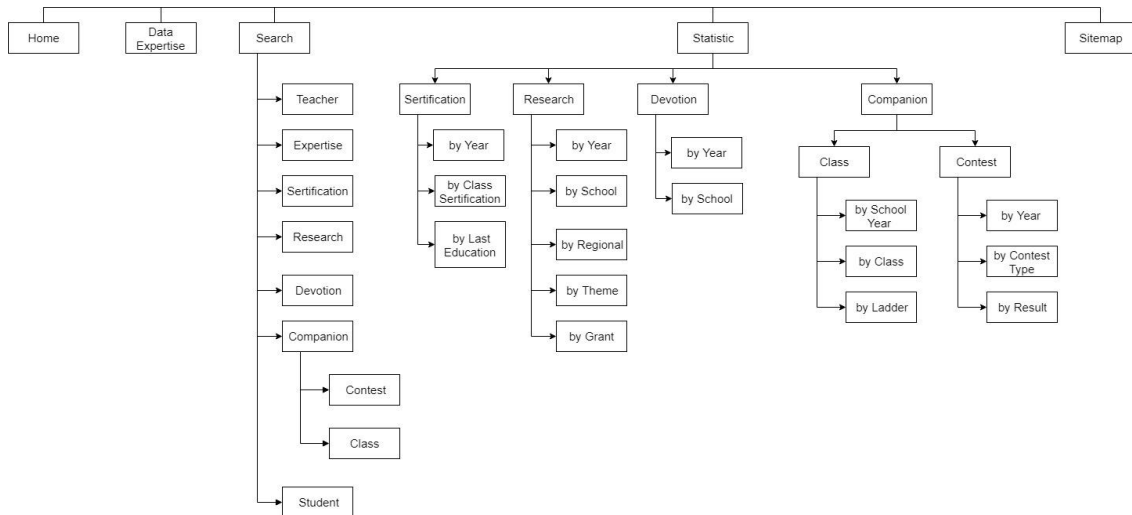


Figure 2. Sitemap

Sitemap of the teacher expert system contains menu of system, that are Home, Data Expertise, Search, Statistic and Sitemap.

3.2. Data Flow Diagram

According to James A Hall, Data Flow Diagram is a use of symbols to describes entities, process, data flows, and data storage relating to system [16]. The process that occurs on this system there are 2 processes, searching processes and view statistic processes. Users can search by add the keywords about teachers, teacher research, teacher certification, and about students whom in the study group.

In the process of displaying statistics, the system will display statistics in the form of teacher research by year, teacher service statistics, and teacher certification statistics.

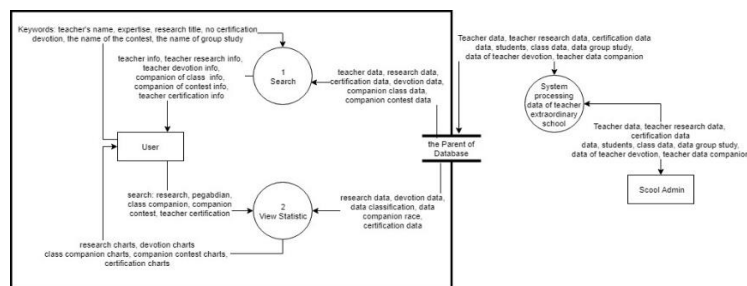


Figure 3. Data Flow Diagram

3.3. Database

The rules of the regulation are used as the basis for creating a database. To design a database, there are some required criteria to create a good database. Date states the criteria of a good database are: (1) Each of table structure more efficient and systematic; (2) Efficient data stored; (3) The smaller the size of the table, faster the database operation; (4) Efficient is characterized by optimal data redundancy (note: in relational databases, data redundancy is unavoidable). Optimal redundancy can improve data integrity, because the effort of spread of data changes from a table to other related tables will be made minimal; (5) There is no data ambiguity in all tables in the database [14]

Based on these criteria, the database design for expertise system special needs teachers are:

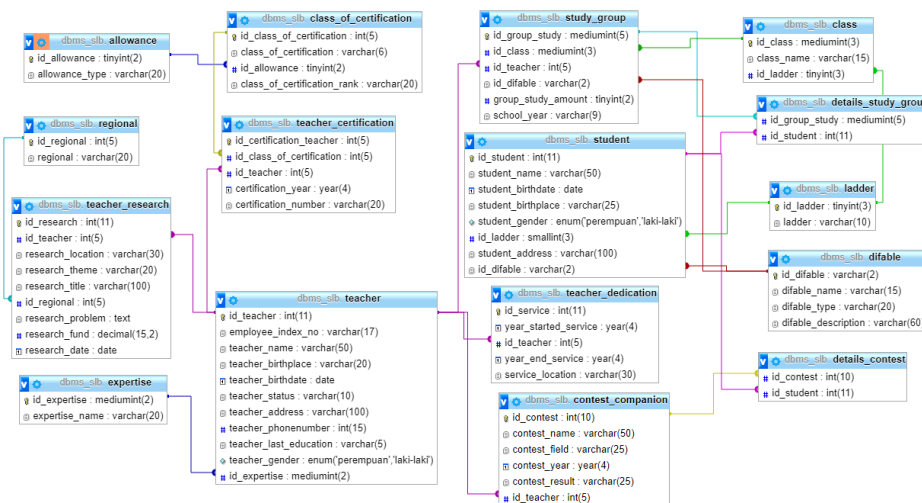


Figure 4. Relation Database

3.4. Database Testing

To ensure the database designed already required the needs and fulfill the good database category, the researcher done some testing uses query command where the researcher already insert some data sample for testing. As for query commands use in this testing are:

3.4.1. Search for student by name

```
SELECT DISTINCT student.student_name AS Name, student.student_gender AS Gender,
class.class_name AS Class_Name, ladder.ladder AS Ladder FROM student JOIN
details_study_group ON student.id_student=details_study_group.id_student JOIN
study_group ON details_study_group.id_study_group=study_group.id_study_group JOIN
class ON class.id_class=study_group.id_class JOIN ladder ON
class.id_ladder=ladder.id_ladder WHERE student.student_name LIKE '%PUTRI%'
```

Figure 5. Query Search Student by Name

If the query execute, it will displays data such as student name, student gender, class, and their grade. The execute result are below.

Result:

Name	Gender	Class_Name	Ladder
HAIRUNISYAH PUTRI	perempuan	TK Nol Besar	TKLB
MELANI RAHMANA PUTRI	perempuan	II	SDLB

Figure 6. Result of student search Query by name

3.4.2. *Displays the Number of Researchers by Region*

```
SELECT regional.regional, COUNT(*) AS
Amount_Research FROM teacher_research JOIN regional
ON teacher_research.id_regional=regional.id_regional
GROUP BY regional
```

Figure 7. Query Search number of researchers by region

The execute query will displays regional of research and the research amount done in that region. The execute result are below.

Result:

regional	Amount_Research
DI YOGYAKARTA	3
JAWA TIMUR	1
KALIMANTAN TENGAH	2

Figure 8. Result for number of researchers query by region

3.4.3. *Displays Researchers Name by Region*

```
SELECT GROUP_CONCAT(teacher.teacher_name) AS "Researcher
Name", regional.regional, COUNT(*) AS Amount_Research FROM
teacher_research JOIN regional ON
teacher_research.id_regional=regional.id_regional JOIN teacher
ON teacher.id_teacher=teacher_research.id_teacher GROUP BY
regional
```

Figure 9. Query Search Reseacher name by Region

The execute query will displays researcher name with the region and the amount of researcher in that region. The execute result are below.

Result:

Researcher Name	regional	Amount_Research
Netty, M.Pd,Drs. Achmad L. Madnia,Suwondo, S.Pd	DI YOGYAKARTA	3
Titik Romadlona Fauziyah, S.Pd	JAWA TIMUR	1
Susmiyati, M.Pd,Syaifullah,M.Pd	KALIMANTAN TENGAH	2

Figure 10. Result researcher name by Region

3.4.4. *Displays Researchers Name by Region*

```
SELECT teacher.teacher_name AS Name, teacher.teacher_gender AS Gender,
teacher.teacher_last_education AS Last_Education,
TIMESTAMPDIFF(YEAR,teacher_dedication.year_started_dedication,
teacher_dedication.year_end_dedication) AS Long_Dedication FROM teacher JOIN
teacher_dedication ON teacher_dedication.id_teacher=teacher.id_teacher
```

Figure 11. Query Search for Dedication Age

The execute query will displays the teacher name, gender, last education, and how long the dedication they have done. The execute result are below.

Result:

Name	Gender	Last_Education	Long_Dedication
Saryani, S.Pd	perempuan	S1	1
Murty Sari, S.Pd	perempuan	S1	1
Rahma Wati, S.Pd	perempuan	S1	1
Nindy Puspita, S.Pd	perempuan	S1	2

Figure 12. Result of Teacher Dedication Age

3.4.5. *Displays Name Teacher with Expertise Skills*

```
SELECT expertise.expertise_name AS Name_Expertise, teacher.teacher_name AS
Name_Teacher FROM expertise JOIN teacher ON
expertise.id_expertise=teacher.id_expertise
```

Figure 13. Query Search Name Teacher with Expertise Skills

The execute query will displays the teacher name and their skills. The execute result are below.

Result:

Name_Expertise	Name_Teacher
membaca braille	Netty, M.Pd
kompensatoris	Drs. Achmad L. Madnia
bahasa isyarat	Saryani, S.Pd
membaca braille	Suwondo, S.Pd
membaca braille	Syaifullah, M.Pd
bahasa isyarat	Murty Sari, S.Pd
kompensatoris	Titik Romadlona Fauziyah, S.Pd
bahasa isyarat	Susmiyati, M.Pd
membaca braille	Rahma Wati, S.Pd
kompensatoris	Nindy Puspita, S.Pd

Figure 14. Result Name Teacher with Expertise Skills

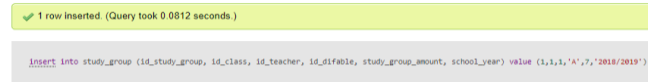
3.4.6. *Constraint Check*

In addition using query for data testing, it given constraint check at the study_group attribute, specially at study_group_amount to make sure that amount of the student accordance to Indonesian Ministry of Education and Culture regulation for clause 24 number 17 year 2017 about how many student allowed in a study group. Constraint check can be added when table creation with syntax:

```
CREATE TABLE study_group (
  id_study_group mediumint(5) primary key,
  id_class mediumint(3),
  id_teacher int(5),
  id_difable varchar(2),
  study_group_amount tinyint(2),
  school_year varchar(9),
  CONSTRAINT check_student_amount CHECK(study_group_amount>5))
```

Figure 15. Query Constraint Check

However, when table testing done with input value more than 5, study_group_amount data remains stored. The researchers finally draw some conclusion that even the constraint check added when table creation, but will not be executed, like this result below:



```

✓ 1 row inserted. (Query took 0.0812 seconds.)

Insert into study_group (id_study_group, id_class, id_teacher, id_difable, study_group_amount, school_year) value (1,1,1,'A',7,'2018/2019')

```

Figure 16. Result of Query Check Update Data Unsuccessful

As the previous explanation, query with constraint check will be execute in exception the teacher enable to teach more than five students in their study group. It supposed to displays error warning if the amount of student added more than five, and then the writer assume it is a failed data input. (figure 16)



```

✓ 1 row affected. (Query took 0.0504 seconds.)

UPDATE study_group SET study_group_amount = 11 WHERE study_group.id_study_group = 1

```

Figure 17. Result of Query Check Update Data Unsuccessful

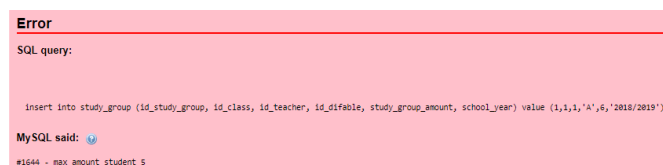
As well with query update, it can save or update data even the amount of students more than five. The system supposed to displays error because the data value more than five. Then the writer assumed that it is failed query update. (figure 17)

For that, it needs another way to use constraint check, which using trigger. For trigger syntax is as follow:

Check for Insert	Check for update
<pre> CREATE TRIGGER check_study_group BEFORE INSERT ON study_group FOR EACH ROW begin if new.study_group_amount >5 then SIGNAL SQLSTATE '45000' SET MESSAGE_TEXT = 'max amount students 5'; end if; end; </pre>	<pre> CREATE TRIGGER check_study_group_update BEFORE UPDATE ON study_group FOR EACH ROW begin if new.study_group_amount >5 then SIGNAL SQLSTATE '45001' SET MESSAGE_TEXT = 'max amount student 5'; end if; end; </pre>

Figure 18. Table Syntax Trigger

After the testing done with input value more than 6, there is an error which means the constraint check worked, as this image below:



```

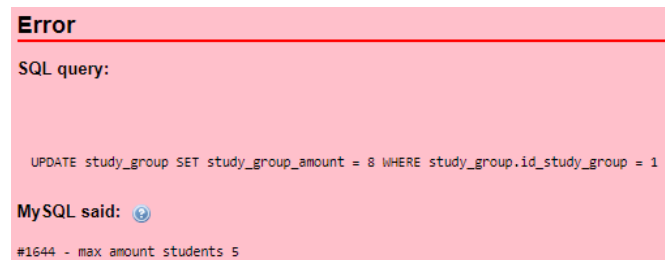
Error
SQL query:
Insert into study_group (id_study_group, id_class, id_teacher, id_difable, study_group_amount, school_year) value (1,1,1,'A',6,'2018/2019')

MySQL said:
#1644 - max amount student 5

```

Figure 19. Result of Query Constraint Check Insert Data Successful

With trigger if the data value more than five in study group, system will display error warning and the writer assumed it is a success data insert with check. (figure 19)



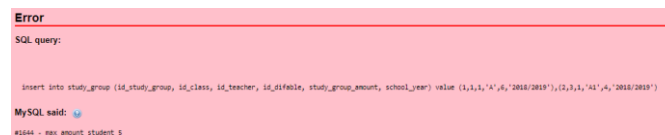
```

Error
SQL query:
UPDATE study_group SET study_group_amount = 8 WHERE study_group.id_study_group = 1
MySQL said:
#1644 - max amount students 5

```

Figure 20. Result of Query Constraint Check Insert Data Successful

As well query update with trigger if data value more than five in a study group, system will displays error warning, and the writer assumed it is a success data insert with check.(figure 20)



```

Error
SQL query:
insert into study_group (id_study_group, id_class, id_teacher, id_sifield, study_group_amount, school_year) value (1,1,1,'A',6,'2018/2019')
MySQL said:
#1644 - max amount student 5

```

Figure 21. Result of Query Constraint Check Insert Data More Than 1 Successful

The writer try to use trigger scenario test with more than one data but one of data value is more than five in study group, system will displays error warning and data enable to save. The writer assumed it is a success data insert with check. (figure 21)

If user insert many data but in one of data there is study_group_amount with value more than 5, the previous insert data will not stored.

4. Conclusion

As the result of the design analysis and previous discussion, the researcher draw the following conclusion: (1) This research resulted database modelling for the expertise of special needs teacher; 2) The design of this system can be used to perform data collection from school profiles, teachers, students, study groups, and achievements obtained by students; (3) This database can determine that one teacher enable to teach only five students accordance to the laws. Information System of expertise for special needs teacher as a media information about special needs school, so prospective student and their parents find out information about the intended school. This system also help the Ministry of Education and Culture to collect teacher and student data.

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5. References

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