

CP2404 Assignment 1

Note: This is an individual assignment. While it is expected that students will discuss their ideas with one another, students need to be aware of their responsibilities in ensuring that they do not deliberately or inadvertently plagiarize the work of others.

Assignment Part 1 – Conceptual Database Modelling

Due date: Friday, 24th Dec 2021 @ 5pm

Assessment Weight: 20%

Rationale

This assignment has been designed to assess students' ability to model a database, by constructing an entity-relationship diagram for a particular business scenario. This assignment addresses the following learning objectives for this subject:

- Develop a database model using the entity-relationship model
- Apply the techniques of normalisation

Requirements (Tasks)

- 1) You are to write a brief discussion of your solution, i.e. how you approached the modeling problem and any issues you may have encountered (maximum of ½ page)
- 2) Based on the descriptions draw a fully labeled and implementable **Entity-Relationship Diagram (ERD)**. Include all entities, relationships, optionalities, connectivities, cardinalities and constraints. You must use Crow's foot notation and MySQL Workbench (or other software) to create the ERD. **A Hand-drawn ERD will NOT be accepted.** A sample ERD can be found in **Appendix A** of this document. (Note: The ERD created using the drawing tool (e.g. MySQL Workbench) will need to be saved (or exported) as an image file and then be included in your document file to be submitted)
- 3) A **summary** to describe the major justifications, assumptions and limitations related to your database design. For example:
 - Assumption/justifications for optionalitiy, connectivities, constraints data type and data domain; and
 - Special cases or data integrity issues that cannot be handled.

***NOTE: Designing the database is an iterative process; you may find yourself going back and forth between the descriptions and task 2 to revise the design. Make sure that your final submission shows consistent design in ERD (Task 2).**

Submission

- You need to submit a single document file (MS Word or PDF format) to LearnJCU. The document should include all the answers for Task 1-3. Please name the file as **LastnameFirstnameA1.doc** or **LastnameFirstnameA1.pdf**.

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- Timestamp shown on LearnJCU assignment submission will be used to determine if the assignment is late or not. Refer to the subject guide for the policy for late submission.

Business Description (Scenario)

Tutoring Prodiigy Services (TPS) owns many Tuition Centers in many countries around the world. The head office is in New York, USA manages the Asian region branches. The branches are in Thailand, Philippines, Malaysia, and Singapore for the Asian region. Each branch provides tuition and after school student care services for Pre-school and primary students. Each branch is managed by a manager. Each branch has at least 20 tutors who teaches subjects range from Mathematics, English, and Science for the Primary and pre-school students. Each branch has about 100 to 200 students. 20 student care service executives are assigned to each branch who manages the students daily care services. The head office in New York manages the overall finances including salaries and other expenses for all branches in other countries.

As branch managers they need to manage staff schedules, collect tuition fees, and manage other daily activities including recruitment of new students.

Managers also gets commission for any new students who join their branch.

Each manager is expected to send a report to the head office in New York every quarter. This report summarizes the total revenues collected, the total expenses such as staff salary, materials purchased, food items for students etc. As TPS does not run an established database system, currently managers fill out a paper form and mail it back to head office. Many managers have complained that preparing this report is a very difficult and time-consuming process. Also, the managers at the head-office also have expressed concerns about the accuracy and verifiability of the reports.

To reduce these concerns and to improve the ease and efficiency with which the branch managers conduct their daily business, the company is proposing to develop a centralized database that can be used by the managers to track the daily business of their branch and to prepare their reports. You have been asked to design a database that satisfies general business description and various user requirements summarized above.

TPS also showed you some samples of various forms and reports to enhance your modeling job. The first example is of a spreadsheet to keep track of their staff details:

Staff ID #	Staff Name	Department	Start Date	Salary	Teaching	Branch
M120	Thomas Agile	Student Care	1/7/2015	\$4,500.00	No	Philippines
M122	Mary Stella	Tutor	6/6/2018	\$2,777.00	Yes	Philippines
M123	Samuel Dennise	Manager	3/3/2015	\$5,000.00	Yes	Philippines
M124	Stuart Wen	Tutor	2/12/2015	\$4,000.00	Yes	Philippines

The second example is of a spreadsheet used to track students:

Student ID#	Student Name	Level	Fees	Enrol Date	Branch	Staff Incharge	Tuition	School
STU100	Timothy George	1	\$ 800.00	8/4/2018	Thailand	Donny	Yes	Western Primary
STU118	Yanni	1	\$ 800.00	9/9/2019	Thailand	Donny	No	Junior Patricks
STU115	Hannah Pauline	2	\$1,200.00	3/2/2020	Thailand	Donny	No	Orchid Primary

The third is an example of tracking subjects and teaching staff:

Subject	Staff ID #	Level Taught
Mathematics	S110	Level 1-6
Science	S120	Level 3-6
English	S120	Level 1-6

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The fourth is an example of tracking classroom allocation:

Classroom	Day	Time	Subject	Level
#1	Monday	4pm-6pm	Mathematics	1
#2	Monday	4pm-6pm	Science	2
#1	Tuesday	4pm-6pm	Mathematics	2
#3	Tuesday	6pm-8pm	English	3

Finally, here is an example of the report that each branch manager must turn in to the main office quarterly. The sample below is from the Malaysia Branch office.

TPS Quarterly Report

Branch Location: Malaysia

1234 Kuala Lumpur,
Address: Malaysia

Quarter: 3

Year: 2019

Manager In-Charge: XXX

Revenues

Total Fees Collected \$ 60,000.00

Expenses

Utilities	\$	6,000.00
Maintenance	\$	500.00
Stationery	\$	2,000.00
Wages	\$	39,000.00
Food Items	\$	4,000.00
Other Expenses	\$	1,000.00
Recreation	\$	500.00
Total Expenses	\$	53,000.00

Net Income/Loss \$ 7,000.00

There are more business descriptions/requirements provided by TPS and they are summarized here:

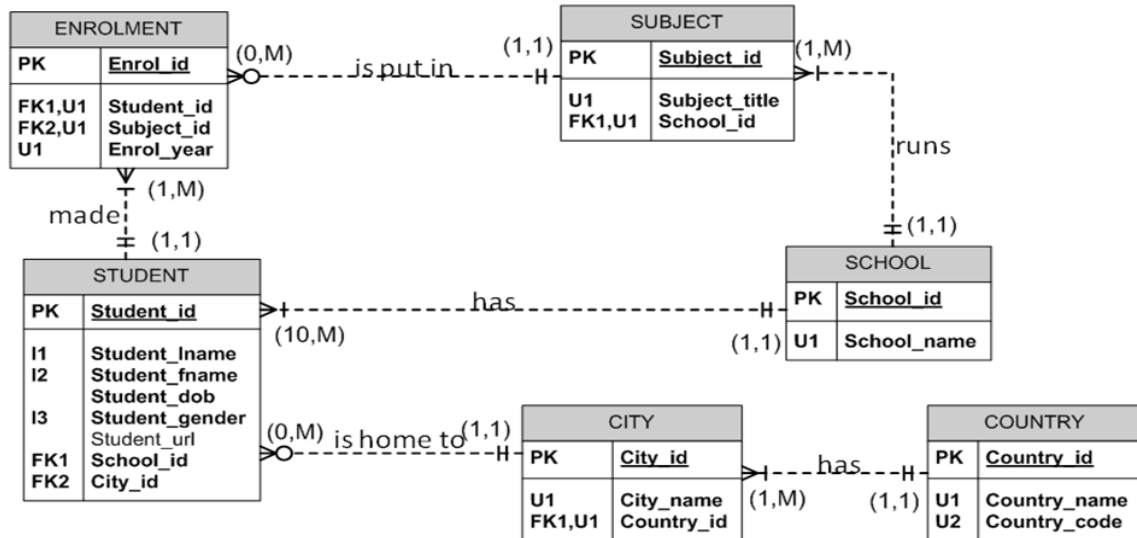
- When a new student is registered, basic information like name, date of birth, contact number, gender, School, Guardian or Parent details should be kept. Student must be above 2 years old and less than 13 years old.

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- New students who register must specify their preference for in-house subject tuition (Eg. English, Math, Science) and the level.
- Each branch is paid a one-time 10% commission on new registered student based on their monthly fees.
- Branches which achieves a minimum enrolled students (10) per month receives a monthly bonus of \$1000.
- 1 tutor must be assigned to only 1 subjects and 3 levels
- Only 10 students per class per subject
- 1 facilitator must be assigned to each class and 2 student care executives must be assigned to day care class
- Each branch can organize 2 outdoor activities per quarter. Activities ranges from educational tours, recreational activities, etc.
- 3 cleaners are assigned to handle each branch and this cleaners' wages is directly from the head office. The Cleaner is paid \$20 per hour which includes transportation.
- Each branch will allocate 3 staff in-charge to manage students' daily activities including classroom activities, schedules, monthly test and keep track of students' overall progress as well as reporting their progress to the parents/guardian (quarterly).
- TPS also runs seminars and activities with some schools on a quarterly basis. This is managed by the branch manager, and this is a form of recruitment exercise where they share the type of activities, students' interactions and students' progress with teachers and parents.
- For maintenance, the branches keep a list of local maintenance companies (e.g. electricians, plumbers, contractors) contracted to TPS and the branch manager selects one from the list to allocate a maintenance job. All maintenance records will be kept and reported to the head office (quarterly)
- Each branch is equipped with a number of pre-installed equipment like fire alarms, air-conditioners, and some classes are equipped with laptops for students' access and learning. Details of each asset item is recorded and being managed. These asset items are inspected and maintenance periodically.
- When the branch purchases a new item, the item is assigned with its number and the database should keep relevant information like the description, department etc.

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APPENDIX A ERD



(Note about the example ERD provided above:

- You are not required to specify extra information like FK1, FK2, U1, I1, I2 etc. Just ignore the notation from the example ERD given above. You are required to specify PK and FK clearly. MySQL Workbench will present PK or FK using the colour icons. If you use other ERD drawing tools you may notate PK and FK using underline or square bracket [] respectively.
- You are not required to specify obvious cardinalities like (0,M), (1,1), (1,M) etc. You are required to specify specific cardinalities which are not presented using crow's foot notation like (1,3), (4,10), (10,M) etc.

Note:

If you want to present the supertype-subtype relationships using an extended-ERD (EERD), you will need to draw the necessary EERD notations using facilities provided by the drawing tool software you use. Alternatively, you can present the supertype-subtype relationships using multiple 1:1 relationships having same PKs for all related entities and describe the special relationships in your document.

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Assignment – Part 1 Database Modelling: Marking Criteria

	Criteria	Exemplary	Good	Satisfactory	Limited	Very Limited
<u>Solution Outline</u>	A brief discussion of your solution outlining the approach taken.	(9, 10) The solution is accurate, logical and desirable. The discussion of solution is appropriate and approaches for the solution chosen is properly detailed.	(7, 8) Exhibits aspects of exemplary (left) and satisfactory (right)	(5, 6) The solution is discussed and the solution chosen is described, but is insufficient in accurateness, logic, depth, etc.	(2, 3, 4) Exhibits aspects of satisfactory (left) and very limited (right)	(0, 1) Not attempted or the discussion of the solution attempted is mostly incorrect or not relevant
<u>Database Modelling</u>	Entities (presented in Business Rules and ERD)	(9, 10) All required entities (based on the business scenario given) are included both in Business Rules and in ERD. All entities are in 3NF	(7, 8) Exhibits aspects of exemplary (left) and satisfactory (right)	(5, 6) All entities included are in 3NF but some required entities are missing either in Business Rules or in ERD OR Most required entities are included but some entities are not in 3NF (need to further normalized)	(2, 3, 4) Exhibits aspects of satisfactory (left) and very limited (right)	(0, 1) Most required entities are missing and most included entities are not in 3NF
	Attributes (Fields) (presented in ERD)	(9, 10) Attributes in each entity are relevant to desired information and correctly designed. All required attributes are included. Attributes are named correctly and logically	(7, 8) Exhibits aspects of exemplary (left) and satisfactory (right)	(5, 6) Some of required attributes are missing but most of included attributes are named appropriately OR Most of required attributes are included but named inappropriately	(2, 3, 4) Exhibits aspects of satisfactory (left) and very limited (right)	(0, 1) Most of required attributes are missing or incorrectly designed (not relevant, or included in a wrong entity etc.)
	Connectivities (presented in Business Rules and ERD)	(9, 10) All relationships are correctly designed and presented both in Business Rules and in ERD.	(7, 8) Exhibits aspects of exemplary (left) and satisfactory (right)	(5, 6) Most but not all (more than 50%) relationships are correctly designed and presented in Business Rules and ERD	(2, 3, 4) Exhibits aspects of satisfactory (left) and very limited (right)	(0, 1) Most of required relationships between entities are missing or incorrectly designed.
	Cardinalities & Optionalities (presented in Business Rules and ERD)	(9, 10) All cardinalities and optionalities are appropriately designed and presented both in Business Rules and in ERD.	(7, 8) Exhibits aspects of exemplary (left) and satisfactory (right)	(5, 6) Most but not all (more than 50%) cardinalities and optionalities are correctly designed and presented in Business Rules and ERD	(2, 3, 4) Exhibits aspects of satisfactory (left) and very limited (right)	(0, 1) Most of required cardinalities and optionalities are missing or incorrectly designed.
	Relationship Names (presented in ERD)	(5) All relationships presented in ERD are appropriately named and well corresponded to Business Rules	(4) Exhibits aspects of exemplary (left) and satisfactory (right)	(3) Most but not all (more than 50%) relationships are named appropriately	(2) Exhibits aspects of satisfactory (left) and very limited (right)	(0, 1) Most relationship names are missing

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	Relationship Strength (presented in ERD)	(5) All relationship strength (weak or strong) is appropriately designed and correctly presented in ERD (dotted line or solid line)	(4) Exhibits aspects of exemplary (left) and satisfactory (right)	(3) Most but not all (more than 50%) relationships are presented correctly corresponding with its strength	(2) Exhibits aspects of satisfactory (left) and very limited (right)	(0, 1) Most relationship strengths are not presented appropriately
	Primary keys	(9, 10) All primary keys are correctly identified and unique	(7, 8) Exhibits aspects of exemplary (left) and satisfactory (right)	(5, 6) Most but not all (more than 50%) primary keys are correctly identified and unique	(2, 3, 4) Exhibits aspects of satisfactory (left) and very limited (right)	(0, 1) Most primary keys are not properly identified or unique
	Foreign keys	(9, 10) All necessary foreign keys are correctly identified	(7, 8) Exhibits aspects of exemplary (left) and satisfactory (right)	(5, 6) Most but not all (more than 50%) necessary foreign keys are correctly identified	(2, 3, 4) Exhibits aspects of satisfactory (left) and very limited (right)	(0, 1) Most foreign keys are not correctly identified
<u>Presentation</u>	ERD	(9,10) All components included in ERD are neatly and clearly presented without unnecessary complexity	(7, 8) Exhibits aspects of exemplary (left) and satisfactory (right)	(5, 6) Some parts in ERD are not clear or easily visible due to inappropriate display of components	(2, 3, 4) Exhibits aspects of satisfactory (left) and very limited (right)	(0, 1) ERD is not included or attempted but mostly inappropriate
<u>Assumptions and Justifications</u>		(9, 10) All necessary assumptions and justifications are appropriately made and listed. All assumptions are correctly incorporated in ERD	(7, 8) Exhibits aspects of exemplary (left) and satisfactory (right)	(5, 6) Most but not all assumptions are made appropriately or correctly incorporated in ERD	(2, 3, 4) Exhibits aspects of satisfactory (left) and very limited (right)	(0, 1) Assumptions are not listed or attempted but mostly incorrect or incorporated in ERD