

University of British Columbia, Vancouver

Department of Computer Science

# CPSC 304 Project Cover Page

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By typing our names and student numbers in the above table, we certify that the work in the attached assignment was performed solely by those whose names and student IDs are included above. (In the case of Project Milestone 0, the main purpose of this page is for you to let us know your e-mail address, and then let us assign you to a TA for your project supervisor.)

In addition, we indicate that we are fully aware of the rules and consequences of plagiarism, as set forth by the Department of Computer Science and the University of British Columbia

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## ***Final Project Summary***

Our final application provides an engaging online environment that **allows users to comprehensively learn new languages** with fellow passionate learners while being assisted by various learning resources. Our focus extends beyond mere language acquisition - we strive to facilitate a comprehensive language learning journey. Given this high-level goal, we provide our users with the opportunity to consult experts specializing in various languages, participate in interactive forums, complete practice exercises, and use various learning resources/materials.

## ***General Changes & Schema Changes***

- Renamed the Score attribute to Points in Exercise4 and also changed its data type from REAL to INTEGER for easier interpretability for the points system for the exercises. Earlier we were using a percentage score on a scale from 0 to 1.
- Renamed the Mode attribute to DeliveryMode in Expert1 and Expert3 due to Mode being a reserved word in SQL.
- Renamed Resource attribute to Material due to Resource being a reserved word in SQL.
- Removed ReceivalDate attribute from Achievement2 and added it to Earns due to inconsistency in the devised ER diagram.
- Changed datatype of TimeLimit in Exercise3 from TIME to INTEGER as it is easier to use for our functions.
- Removed Interacts relation as the SQL server currently in use does not support CASCADE ON DELETE for self-referencing foreign keys.
- Added more INSERT INTO statements.

## ***Note about Constraints***

Our original ER diagram contained three participation constraints that could only be captured in our implementation through the use of assertions. Since the project rubric mentioned that assertions need not be implemented for the CPSC 304 project, we did not include them in our final submission nor our initialization script but instead acknowledge their presence below:

- Cannot enforce that every Forum is monitored by at least one Bot (need to create an assertion between Forum4 and Bot\_Monitors4);
- Cannot enforce that every Expert specializes in at least one Language (need to create an assertion between Expert4 and Specializes);
- Cannot enforce that every learner learns at least one Language (need to create an assertion between Learner\_Consults and Learns).

## Final Schema & Screenshots

Language1(LanguageName, NumChars)

```
SQL> SELECT * FROM Language1;
```

LANGUAGENAME	NUMCHARS
English	26
Spanish	27
French	26
German	30
Chinese	26
Korean	24

Language2(LanguageName, Dialect)

```
SQL> SELECT * FROM Language2;
```

LANGUAGENAME	DIALECT
Chinese	Cantonese
Chinese	Mandarin
Chinese	Shanghainese

Expert1(DeliveryMode, Capacity)

```
SQL> SELECT * FROM EXPERT1;
```

DELIVERYMODE	CAPACITY
Online Morning	20
Online Afternoon	20
Online Evening	15
In-Person Morning	15
In-Person Afternoon	15
In-Person Evening	10

Expert3(ExpertName, City, DeliveryMode)

```
SQL> SELECT * FROM Expert3;
```

EXPERTNAME	CITY	DELIVERYMODE
Romina M	Vancouver	Online Morning
Annie W	Vancouver	Online Afternoon

Expert4(ExpertEmail, **ExpertName**, **City**)

- experts.php: line 324

Results for viewing all experts:

ExpertEmail	ExpertName	City
romina.m@mail.com	Romina M	Vancouver
annie.w@mail.com	Annie W	Vancouver
sohbat.s@mail.com	Sohbat S	Vancouver
james.w@mail.com	James W	Toronto
kayla.k@mail.com	Kayla K	Toronto
kate.m@mail.com	Kate M	Edmonton
anita.m@mail.com	Anita M	Seattle

Forum1(Title, Purpose)

SQL> SELECT * FROM FORUM1;
TITLE
PURPOSE
General Discussion Discuss various topics
Beginner Mandarin Chinese Get help with Beginner Mandarin
French In Canada Moving to Quebec, you will need this

Forum3(Title, UserCapacity)

SQL> SELECT * FROM FORUM3;	
TITLE	USERCAPACITY
General Discussion	1000
Beginner Mandarin Chinese	200
French In Canada	400
Language Learning Book Club	1000
German Speaking Community	350

Forum4(URL, Status, **Title**)

- forums.php: line 274

Results for viewing all forums:

URL	Status	Title
http://example.com/general-discussion	Active	General Discussion
http://example.com/beginner-mandarin-chinese	Active	Beginner Mandarin Chinese
http://example.com/french-in-canada	Inactive	French In Canada
http://example.com/language-learning-book-club	Active	Language Learning Book Club
http://example.com/german-speaking-community	Active	German Speaking Community

### Exercise1(ExerciseName, Purpose)

```
SQL> SELECT * FROM Exercise1;
```

EXERCISENAME
Active to Passive Voice English
Test identification and conversion in Passive and Active voice in English
Parisian Culture
Test your knowledge in Parisian Culture
Chinese Vocabulary Quiz
Test Chinese vocabulary knowledge

### Exercise3(ExerciseName, TimeLimit)

```
SQL> SELECT * FROM Exercise3;
```

EXERCISENAME	TIMELIMIT
Active to Passive Voice English	100
Parisian Culture	100
Chinese Vocabulary Quiz	90
Spanish Grammar Quiz	60
German Pronunciation Workout	
Korean Alphabet Quiz	45
Mock Spelling Bee	15
French Pronunciation Quiz	30
Chinese Oral Exercise	20
Advanced Spanish Grammar Quiz	60
Must-Know Korean Phrases	75

### Exercise4(ExerciseName, ExerciseNumber, Points)

```
SQL> SELECT * FROM Exercise4;
```

EXERCISENAME	EXERCISENUMBER	POINTS
Active to Passive Voice English	61	90
Parisian Culture	62	85
Chinese Vocabulary Quiz	63	77
Spanish Grammar Quiz	64	95
German Pronunciation Workout	65	80
Korean Alphabet Quiz	92	95
Mock Spelling Bee	93	49
French Pronunciation Quiz	94	
Chinese Oral Exercise	95	88
Advanced Spanish Grammar Quiz	96	75
Must-Know Korean Phrases	97	97

### Achievement1(RewardID, RewardName UNIQUE)

```
SQL> SELECT * FROM Achievement1;
```

REWARDID	REWARDNAME
50	Initiator
51	Gold Medal
52	Silver Medal
53	Bronze Medal
54	Certificate of Achievement
55	Badge of Honor

Achievement2(AchievementID, AchievementName, AchievementDescription, **RewardID**)

```
SQL> SELECT * FROM Achievement2;
```

ACHIEVEMENTID	ACHIEVEMENTNAME		REWARDID
40	Learning Enthusiast		
	Start Your Learning Journey		50
41	Completionist		
	Complete all exercises		54
42	Master Speaker		
	Complete all pronunciation challenges		51

Material(MaterialID, MaterialName, Purpose)

- materials.php: line 339

All study materials offered:

MaterialID	MaterialName	Purpose
11	English in Use	A Self-Study Reference and Practice Book for Intermediate Learners of English with Answers
12	Spanish Maestro	A Self-Study Reference and Practice Book for Intermediate Learners of Spanish with Answers
13	Elegance in French	A Self-Study Reference and Practice Book for Intermediate Learners of French with Answers
14	Chinese Stories for Language Learners	A treasury of proverbs and folktales in Chinese and English
15	German for Dummies	The fun and easy way to learn the fascinating language of German with integrated audio clips!
21	Example Bookstore	Find Your Favorite and Necessary books
22	Example Lingo Fitness App	Can your tongue pronounce correctly?
23	Example Language Learning	Get help to learn new language on your own time
24	Example Pronunciation Platform	Learn the correct pronunciations in over 100 languages
25	Example Forum	Get access to all online forums
31	Multi-Language Dictionary	Get words definitions and translations in over 20 languages
32	How Good is Your Spanish?	Comprehensive Spanish Language Quizzes
33	Teach A Tongue	Learn New languages
34	Contact a LingoXpert	Get in touch with language experts from all over the world
35	Are you speaking Correctly?	Learn all the nuances of the language of your choice

Book(MaterialID, Author)

- materials.php: line 346 (joined with Material table to get MaterialName)

All books offered:

MaterialID	MaterialName	Author
11	English in Use	John Doe
12	Spanish Maestro	Gabriel Martinez
13	Elegance in French	Celestine Dior
14	Chinese Stories for Language Learners	Vivian Ling
15	German for Dummies	Paulina Christensen

App(**MaterialID**, Developer)

- materials.php: line 353 (joined with Material table to get MaterialName)

All apps offered:

MaterialID	MaterialName	Developer
31	Multi-Language Dictionary	DD Dev Ops
32	How Good is Your Spanish?	3Cent Games
33	Teach A Tongue	Foreign Lingo
34	Contact a LingoXpert	AllInfo Techs
35	Are you speaking Correctly?	NoSure Info Corps

Website(**MaterialID**, URL)

- materials.php: line 360 (joined with Material table to get MaterialName)

All websites offered:

MaterialID	MaterialName	URL
21	Example Bookstore	http://examplebookstore.com
22	Example Lingo Fitness App	http://examplelingofitnessapp.com
23	Example Language Learning	http://examplelanguagelearning.com
24	Example Pronunciation Platform	http://examplepronunicationplatform.com
25	Example Forum	http://exampleforum.com

Learner\_Consums(**UserID**, Username UNIQUE, Age, Password, **ExpertEmail**)

SQL> SELECT * FROM LEARNER_CONSUMS;			
USERID	USERNAME		AGE
-----			
PASSWORD			
-----			
EXPERTEMAIL			
-----			
1	User 1		21
pass1			
romina.m@mail.com			
2	User 2		22
pass2			
annie.w@mail.com			

Bot\_Monitors1(**BotName**, Purpose)

SQL> SELECT * FROM BOT_MONITORS1;	
BOTNAME	
-----	
PURPOSE	
-----	
SpamGuardBot	Monitor spam messages
AutoResponderBot	Automatically respond to messages
AnalyticsBot	Analyze user interactions



Bot\_Monitors3(**BotName**, **Creator**, **CreationDate**)

```
SQL> SELECT * FROM BOT_MONITORS3;
```

BOTNAME	CREATOR	CREATIONDA
SpamGuardBot	TechzCorp	2023-09-11
AutoResponderBot	TechzCorp	2020-01-21
AnalyticsBot	DataInsightsAnswers	2022-09-11

Bot\_Monitors4(**BotName**, **Version**, **Creator**, **URL NOT NULL**)

```
SQL> SELECT * FROM BOT_MONITORS4;
```

BOTNAME	VERSION	CREATOR	URL
SpamGuardBot	v1.0	TechzCorp	http://example.com/general-discussion

Question\_Has(**ExerciseName**, **ExerciseNumber**, **QuestionName**, **Type**)

- exercise.php: lines 461-463

Questions:

ExerciseName	ExerciseNumber	QuestionName	Type
Korean Alphabet Quiz	92	List all basic consonants	Beginner
Korean Alphabet Quiz	92	List all basic vowels	Beginner

Participates(**UserID**, **URL**)

- forums.php: line 281

Results for viewing your forums:

User ID	URL
2	http://example.com/french-in-canada

Earns(UserID, AchievementID, ReivalDate)

```
SQL> SELECT * FROM Earns;
```

USERID	ACHIEVEMENTID	RECEIVALD
1	40	01-SEP-23
2	40	11-FEB-20
3	40	12-MAR-22
4	40	08-NOV-21
5	40	29-OCT-23
6	40	11-DEC-23
1	50	01-SEP-23
2	46	21-SEP-23
3	47	12-OCT-23
4	48	10-APR-23
5	51	11-DEC-23

Specializes(ExpertEmail, LanguageName, Dialect, YearsExperience)

```
SQL> SELECT * FROM SPECIALIZES;
```

EXPERTEMAIL	LANGUAGE	DIALECT	YEARESEXPERIENCE
romina.m@mail.com	Korean	Gyeonggi Dialect	10
annie.w@mail.com	Chinese	Mandarin	10

Learns(UserID, LanguageName, Dialect, StartDate)

```
SQL> SELECT * FROM Learns;
```

USERID	LANGUAGE	DIALECT	STARTDATE
1	Korean	Gyeonggi Dialect	01-SEP-23
2	Chinese	Mandarin	21-SEP-23
3	English	American English	12-OCT-23

Uses(UserID, LanguageName, Dialect, MaterialID)

```
SQL> SELECT * FROM USES;
```

USERID	LANGUAGE	DIALECT	MATERIALID
1	Korean	Gyeonggi Dialect	35
2	Chinese	Mandarin	14
3	English	American English	24

Completes(UserID, LanguageName, Dialect, ExerciseName, ExerciseNumber,  
CompletionDate)

```
SQL> SELECT * FROM Completes;
```

USERID	LANGUAGE	DIALECT	EXERCISENAME	EXERCISENUMBER	COMPLETIONDATE
1	German				
	Swiss German				
	German Pronunciation Workout			65	01-OCT-23
2	Chinese				
	Mandarin				
	Chinese Vocabulary Quiz			63	13-OCT-23

## SQL Queries & Screenshots

### INSERT Operation

- **materials.php: lines 364-401**
- **Note:** The same functionality applies to adding apps and websites to the list of study materials.

**Before:**

All books offered:

MaterialID	MaterialName	Author
11	English in Use	John Doe
12	Spanish Maestro	Gabriel Martinez
13	Elegance in French	Celestine Dior
14	Chinese Stories for Language Learners	Vivian Ling
15	German for Dummies	Paulina Christensen

All study materials offered:

MaterialID	MaterialName	Purpose
11	English in Use	A Self-Study Reference and Practice Book for Intermediate Learners of English with Answers
12	Spanish Maestro	A Self-Study Reference and Practice Book for Intermediate Learners of Spanish with Answers
13	Elegance in French	A Self-Study Reference and Practice Book for Intermediate Learners of French with Answers
14	Chinese Stories for Language Learners	A treasury of proverbs and folktales in Chinese and English
15	German for Dummies	The fun and easy way to learn the fascinating language of German with integrated audio clips!
21	Example Bookstore	Find Your Favorite and Necessary books
22	Example Lingo Fitness App	Can your tongue pronounce correctly?
23	Example Language Learning	Get help to learn new language on your own time
24	Example Pronunciation Platform	Learn the correct pronunciations in over 100 languages
25	Example Forum	Get access to all online forums
31	Multi-Language Dictionary	Get words definitions and translations in over 20 languages
32	How Good is Your Spanish?	Comprehensive Spanish Language Quizzes
33	Teach A Tongue	Learn New languages
34	Contact a LingoXpert	Get in touch with language experts from all over the world
35	Are you speaking Correctly?	Learn all the nuances of the language of your choice

The above two pictures are the Book and Material tables before adding a new study material.

#### Add Book

Add a book.

MaterialID:

Author:

Here is the user input for the MaterialID and Author of the book they want to add. In this case, the user is adding a book identified by the MaterialID = 1 and the Author named "Someone".

### After:

All books offered:

MaterialID	MaterialName	Author
1	Update MaterialName	Someone
11	English in Use	John Doe
12	Spanish Maestro	Gabriel Martinez
13	Elegance in French	Celestine Dior
14	Chinese Stories for Language Learners	Vivian Ling
15	German for Dummies	Paulina Christensen

All study materials offered:

MaterialID	MaterialName	Purpose
11	English in Use	A Self-Study Reference and Practice Book for Intermediate Learners of English with Answers
12	Spanish Maestro	A Self-Study Reference and Practice Book for Intermediate Learners of Spanish with Answers
13	Elegance in French	A Self-Study Reference and Practice Book for Intermediate Learners of French with Answers
14	Chinese Stories for Language Learners	A treasury of proverbs and folktales in Chinese and English
15	German for Dummies	The fun and easy way to learn the fascinating language of German with integrated audio clips!
21	Example Bookstore	Find Your Favorite and Necessary books
22	Example Lingo Fitness App	Can your tongue pronounce correctly?
23	Example Language Learning	Get help to learn new language on your own time
24	Example Pronunciation Platform	Learn the correct pronunciations in over 100 languages
25	Example Forum	Get access to all online forums
31	Multi-Language Dictionary	Get words definitions and translations in over 20 languages
32	How Good is Your Spanish?	Comprehensive Spanish Language Quizzes
33	Teach A Tongue	Learn New languages
34	Contact a LingoXpert	Get in touch with language experts from all over the world
35	Are you speaking Correctly?	Learn all the nuances of the language of your choice
1	Update MaterialName	Update Purpose

After clicking the “Add” button, the book was added to the Book and Material tables as shown by the above two photos. This step corresponds to the INSERT statements from lines 396 and 382, respectively, in the query. The user will need to update the default values set for the MaterialName and Purpose attributes in the Material table though a different function.

## DELETE Operation

- **materials.php: lines 512-539**
- **Note:** The same functionality applies to removing apps and websites from the list of study materials.

**Before:**

All books offered:

MaterialID	MaterialName	Author
1	Update MaterialName	Someone
11	English in Use	John Doe
12	Spanish Maestro	Gabriel Martinez
13	Elegance in French	Celestine Dior
14	Chinese Stories for Language Learners	Vivian Ling
15	German for Dummies	Paulina Christensen

All study materials offered:

MaterialID	MaterialName	Purpose
11	English in Use	A Self-Study Reference and Practice Book for Intermediate Learners of English with Answers
12	Spanish Maestro	A Self-Study Reference and Practice Book for Intermediate Learners of Spanish with Answers
13	Elegance in French	A Self-Study Reference and Practice Book for Intermediate Learners of French with Answers
14	Chinese Stories for Language Learners	A treasury of proverbs and folktales in Chinese and English
15	German for Dummies	The fun and easy way to learn the fascinating language of German with integrated audio clips!
21	Example Bookstore	Find Your Favorite and Necessary books
22	Example Lingo Fitness App	Can your tongue pronounce correctly?
23	Example Language Learning	Get help to learn new language on your own time
24	Example Pronunciation Platform	Learn the correct pronunciations in over 100 languages
25	Example Forum	Get access to all online forums
31	Multi-Language Dictionary	Get words definitions and translations in over 20 languages
32	How Good is Your Spanish?	Comprehensive Spanish Language Quizzes
33	Teach A Tongue	Learn New languages
34	Contact a LingoXpert	Get in touch with language experts from all over the world
35	Are you speaking Correctly?	Learn all the nuances of the language of your choice
1	Update MaterialName	Update Purpose

The above two pictures show the Book and Material tables before removing an existing study material.

### Remove Study Material

Input the MaterialID of the study material you wish to remove.

MaterialID:

Here is the user input for removing study materials from the Material table. In this case, the user is trying to remove the study material with MaterialID = 1.

**After:**

All books offered:

MaterialID	MaterialName	Author
11	English in Use	John Doe
12	Spanish Maestro	Gabriel Martinez
13	Elegance in French	Celestine Dior
14	Chinese Stories for Language Learners	Vivian Ling
15	German for Dummies	Paulina Christensen

All study materials offered:

MaterialID	MaterialName	Purpose
11	English in Use	A Self-Study Reference and Practice Book for Intermediate Learners of English with Answers
12	Spanish Maestro	A Self-Study Reference and Practice Book for Intermediate Learners of Spanish with Answers
13	Elegance in French	A Self-Study Reference and Practice Book for Intermediate Learners of French with Answers
14	Chinese Stories for Language Learners	A treasury of proverbs and folktales in Chinese and English
15	German for Dummies	The fun and easy way to learn the fascinating language of German with integrated audio clips!
21	Example Bookstore	Find Your Favorite and Necessary books
22	Example Lingo Fitness App	Can your tongue pronounce correctly?
23	Example Language Learning	Get help to learn new language on your own time
24	Example Pronunciation Platform	Learn the correct pronunciations in over 100 languages
25	Example Forum	Get access to all online forums
31	Multi-Language Dictionary	Get words definitions and translations in over 20 languages
32	How Good is Your Spanish?	Comprehensive Spanish Language Quizzes
33	Teach A Tongue	Learn New languages
34	Contact a LingoXpert	Get in touch with language experts from all over the world
35	Are you speaking Correctly?	Learn all the nuances of the language of your choice

After clicking the “Delete” button, the book is removed from the Book and Material tables, as seen in the above two pictures. This step corresponds to the DELETE statement from line 528 in the query. Due to the “ON DELETE CASCADE” constraint from lines 198-198 in the SQL file called script.sql, the book was deleted from the Material table and the corresponding tuple was automatically deleted from the Book table as well.

# UPDATE Operation

- admin.php: lines 406-455

**Before:**

Results for viewing Achievement2:

AchievementID	AchievementName	AchievementDescription	RewardID
40	Learning Enthusiast	Start Your Learning Journey	50
41	Completionist	Complete all exercises	54
42	Master Speaker	Complete all pronunciation challenges	51
43	Language Pro	Achieve fluency in a language	55
44	Beginner Language Guru	Complete Beginner Language Requirements	52
45	Bookworm	Read 100 books	53
46	New Language Learner	Start a new Language: Chinese	50
47	New Language Learner	Start a new Language: English	50
48	New Language Learner	Start a new Language: French	50
49	New Language Learner	Start a new Language: German	50
50	New Language Learner	Start a new Language: Korean	50
51	New Language Learner	Start a new Language: Spanish	50

The picture above shows all the tuples present in the Achievement2 relation.

**During:**

## Update Achievements

Update the achievements offered across the Lingo Exchange system by updating the attributes of tuples in Achievement2. Specify the AchievementID of the tuple you'd like updated and then specify the updated attribute values for that tuple.

Achievement ID:

Attribute Name	Updated Attribute Value
AchievementName	<input type="text"/>
AchievementDescription	<input type="text" value="Completes exercises"/>
RewardID	<input type="text" value="52 (Silver Medal)"/>

The user can then choose to update any number of non-primary key attributes in the Achievement2 relation, with RewardID being a foreign key that references the Achievement1 relation. In the picture above, the user chooses to update the AchievementDescription and RewardID of the achievement with an AchievementID = 41.

**After:**

Results for viewing Achievement2:

AchievementID	AchievementName	AchievementDescription	RewardID
40	Learning Enthusiast	Start Your Learning Journey	50
41	Completionist	Completes exercises	52
42	Master Speaker	Complete all pronunciation challenges	51
43	Language Pro	Achieve fluency in a language	55
44	Beginner Language Guru	Complete Beginner Language Requirements	52
45	Bookworm	Read 100 books	53
46	New Language Learner	Start a new Language: Chinese	50
47	New Language Learner	Start a new Language: English	50
48	New Language Learner	Start a new Language: French	50
49	New Language Learner	Start a new Language: German	50
50	New Language Learner	Start a new Language: Korean	50
51	New Language Learner	Start a new Language: Spanish	50

Upon clicking 'Update Achievement' and viewing the tuples in Achievement2, we can see that the update did indeed take place!



## Selection Operation

- forums.php: lines 301-346

### Before:

View a **filtered** list of existing forums.  
Select the attributes you want to filter by specifying the desired attribute value.  
Leave the attribute value blank if you do not want to filter by that attribute.

Attribute Name	Attribute Value
URL	<input type="text"/>
Status	<input type="text"/>
Title	<input type="text"/>

Filter Forums

The picture above shows the interface that allows a user to specify any number of filtering conditions for viewing the tuples in the Forum4 relation.

### During:

View a **filtered** list of existing forums.  
Select the attributes you want to filter by specifying the desired attribute value.  
Leave the attribute value blank if you do not want to filter by that attribute.

Attribute Name	Attribute Value
URL	<input type="text"/>
Status	<input type="text" value="Active"/>
Title	<input type="text"/>

Filter Forums

The user can specify the filtering conditions by providing the values for the attributes that they want in the filter (and leaving the attributes that they do not want in the filter blank). In the picture above, we see that the user chooses to filter for forums that are of Status = Active.

### After:

Results for viewing filtered forums:

URL	Status	Title
http://example.com/general-discussion	Active	General Discussion
http://example.com/beginner-mandarin-chinese	Active	Beginner Mandarin Chinese
http://example.com/language-learning-book-club	Active	Language Learning Book Club
http://example.com/german-speaking-community	Active	German Speaking Community

Upon clicking 'Filter Forums', the user can view the filtered tuples that satisfy their specified conditions!

# Projection Operation

- admin.php: lines 381-404

**Before:**

## Project Attributes

Project the specified attributes for a specific table in the database.  
Please provide the desired attribute names as a **comma-separated list**.

Table Name:

Attributes:

The picture above shows the interface that allows a user to choose any number of attributes to view from any relation in the database.

**During:**

## Project Attributes

Project the specified attributes for a specific table in the database.  
Please provide the desired attribute names as a **comma-separated list**.

Table Name:

Attributes:

The user must first specify the name of the relation they want to view along with a comma-separated list of attributes they want to view from that relation. Note that we provide the user with the functionality of viewing all the relation names and all the corresponding attributes names for each relation before this 'Project Attributes' functionality. In the above picture, the user chooses to view the ExpertEmail and City attributes from the Expert4 relation.

**After:**

Results for projecting the specified attributes of EXPERT4:

EXPERTEMAIL	CITY
romina.m@mail.com	Vancouver
annie.w@mail.com	Vancouver
sohbat.s@mail.com	Vancouver
james.w@mail.com	Toronto
kayla.k@mail.com	Toronto
kate.m@mail.com	Edmonton
anita.m@mail.com	Seattle

Upon clicking 'Project Attributes', the user can then view the attributes from their specified relation!

## Join Operation

- **home.php: lines 626-640**
- **Note:** Joins all the languages and dialect combinations with the minimum number of characters in each language specified by the user, and displays the result in a table.

### Before:

VIEW ALL PROVIDED LANGUAGE NAMES HAVING SPECIFIED MINIMUM NUMBER OF CHARACTERS

Minimum Number of Characters:

Show Languages

### During:

VIEW ALL PROVIDED LANGUAGE NAMES HAVING SPECIFIED MINIMUM NUMBER OF CHARACTERS

Minimum Number of Characters:

Show Languages

### After:

Retrieved Provided Languages with minimum of 27 Characters:

Language Name	Dialect	Number of Characters
German	Standard German	30
German	Swiss German	30
Spanish	European Spanish	27
Spanish	Latin American Spanish	27

## Aggregation with GROUP BY Operation

- **home.php: lines 682-701**
- **Note:** Retrieves the number of achievements of the same reward type/name.
- **Note:** This output is for User 1 (Log in with the credentials [Username: User 1 and Password: pass1])

**Before:**

VIEW NUMBER OF ACHIEVEMENTS EARNED FOR A REWARD

View Achievement Count

**After:**

Retrieved User's Reward Count:

Reward Name	Number Earned
Certificate of Achievement	1
Initiator	2

## Aggregation with HAVING Operation

- **home.php: lines 611-624**
- **Note:** The user is able to specify the minimum number of dialects a language can have in the retrieved output of languages

### Before:

VIEW ALL PROVIDED LANGUAGE NAMES HAVING SPECIFIED MINIMUM NUMBER OF DIALECTS

Minimum Number of Dialects:

Show Languages

### During:

VIEW ALL PROVIDED LANGUAGE NAMES HAVING SPECIFIED MINIMUM NUMBER OF DIALECTS

Minimum Number of Dialects:

Show Languages

### After:

Retrieved Languages with a Minimum of 2 Dialects:

Language Name	Number of Dialects
Chinese	3
English	2
French	4
German	2
Spanish	2

## Nested Aggregation with GROUP BY Operation

- **exercise.php: lines 589-626**
- **Note:** This output is for User 2 (Log in with the credentials [Username: User 2 and Password: pass2])

**Before:**

### Count Points Above Average

View all the languages you completed exercises for and calculate the count of exercises which award points above average.

Calculate

This section of the application calculates the number of exercises completed that award points above the average amount of points obtained by all users across all exercises.

**After:**

LanguageName	CountAboveAverage
Korean	1
English	1
Chinese	1

After clicking the “Calculate” button, the user will see all the languages they have completed exercises for and the count of exercises which award points above average. This corresponds to the nested aggregation with GROUP BY statement from lines 605-617 in the query.

## Division Operation

- experts.php: lines 372-384

### **Before:**

View the experts who specialize in all the languages offered across our platform.

View Specialized Experts

### **After:**

Results for viewing specialized experts:

ExpertEmail	ExpertName
kate.m@mail.com	Kate M
anita.m@mail.com	Anita M

The pictures above highlight how the user can view all the experts who specialize in every language offered across the Lingo Exchange platform.

## Basic Error Handling

- We include some of our basic error handling operations below.
  - Message 1 - **materials.php**: lines 396-400, 435-439, 474-478
  - Message 2 - **forums.php**: lines 352-354.
  - Message 3 - **materials.php**: lines 498-509, 527-238
  - Message 4 - **exercise.php**: lines 460-473, 507-518

**ERROR:** Check that the MaterialID is correct (it shouldn't exist in the list of resources)

**ERROR:** You must specify a valid Forum URL to join.

This MaterialID doesn't exist :( Check the list of Materials for the correct ID.

There are no questions for this exercise name and number :( Check the exercise name and number again.

## Basic User Notification

- We include some of our user notifications (for completing an UPDATE, INSERT, or DELETE operations) below.
  - Notification 1 - **forums.php**: lines 399-402 (DELETE operation)
  - Notification 2 - **admin.php**: lines 447-453 (UPDATE operation)
  - Notification 3 - **materials.php**: line 396-400 (INSERT operation)

**SUCCESS:** You successfully left a forum (if you had joined it to begin with) :)

**SUCCESS:** The attributes of the specified achievement (if it existed) have been updated in Achievement2 :)

**SUCCESS:** Added a new book :)

## Basic Security Practices

- Our application is secure against malicious SQL injections, as demonstrated by the example below :)

### Join a Forum

Join an existing forum!

Forum URL:

**ERROR:** We encountered a problem when trying to add you to a forum :( Make sure that you've entered the URL to an *existing* Forum that you haven't already joined (use our view forums functionality to see what's available).