Coolkids Preschool Information Management System

Feng Wang
Tianmin Li
Yingjie Yu

Table of Contents

1. Business Application

1.1 Introduction

Education has always been a top priority to parents and the competition even starts from preschools. In Bay Area, it is very common that parents have to wait for months or even years to get their kids into their dream preschools. Yet, there is no good tracking system for parents to get transparent information about preschools and applications. This project is aiming to solve this problem by providing a one stop shop for preschool information management that allows schools to put down their information and let parents schedule school tours, apply online, track progress and review schools.

1.2 Objective

Following are the objectives of Preschool Information Management System:

1). Efficiency and openness for preschools: provide a platform for preschools to display information, manage tours and applications and receive feedbacks.

2). Convenience for parents: provide one-stop solution for parents from initial selection of preschools to evaluate preschool experience.

3). Access of data for key stakeholders such as school districts: provide insights for related stakeholders to plan, organize and distribute resources.

1.3 Scope

This project will be targeting preschools in Bay Area. If information collected can be well maintained and user feedbacks are positive, the application will potentially scale to a nationwide level.

2. Types of Users

2.1 Swim Lane diagram for Business Process
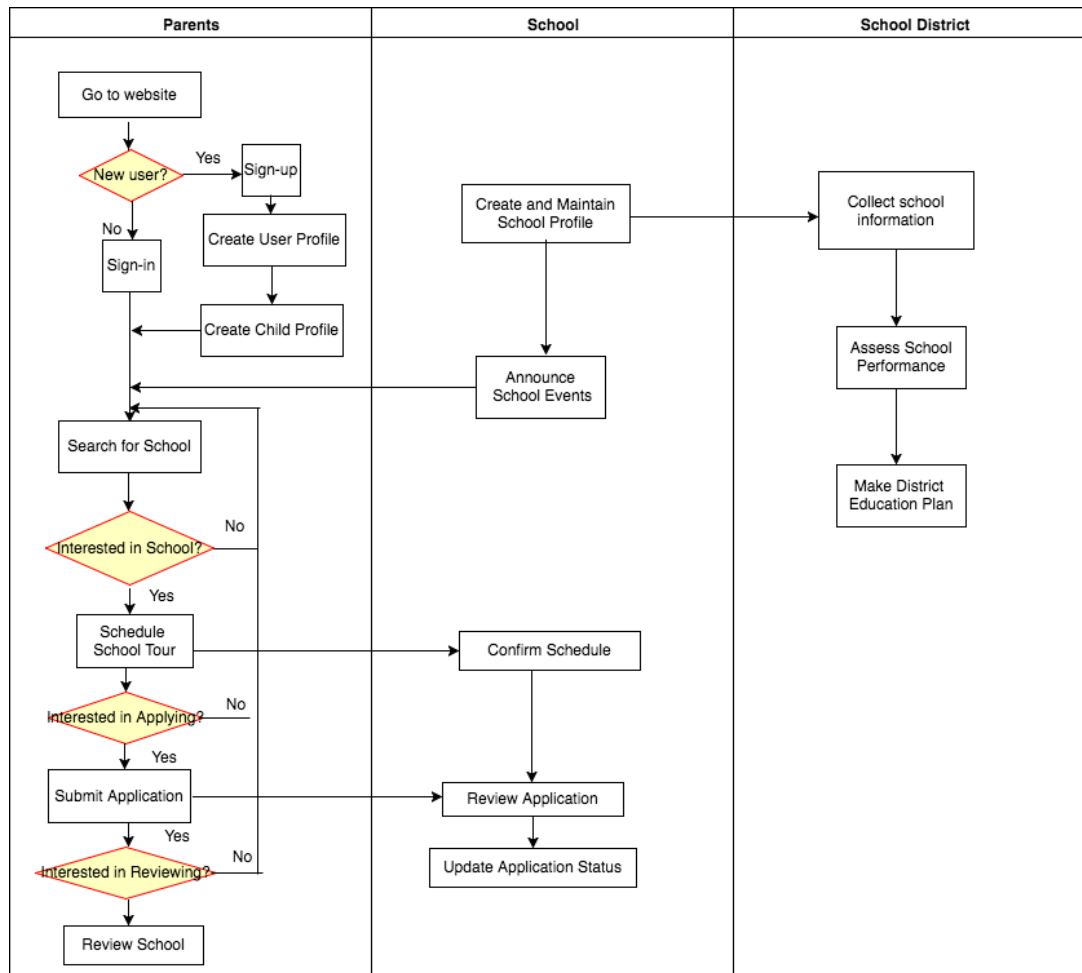
2.2 User types Interacting with the Application
Below users or entities would play a pivotal role in our Preschool Management System
1). Preschools: will be able to record, manage, and update school information, make announcements of school events, confirm school tours.

2). Parents/User: will be able to see and update/edit their children's enrollment application, schedule school tours, apply for preschools and review preschools.

3). School Districts: will be able to monitor school information and get feedbacks from parents.

3. Use Cases

3.1 Preschools
1. Create school profiles
2. Track appointment of school tours
3. Plan and organize events such as info sessions and open houses

3.2 Parents/User
1. Search preschool based on criteria such as zip code and teaching philosophy
2. Schedule for school tours
3. Apply to preschools
4. Create, maintain, and update parents and children's profile
5. Write review and rate for preschool

3.3 School Districts
1. Maintain information of all schools in the districts
2. Assess school performance based on criteria such as reviews

4. Logical Schema – Data model (Workbench) and NoSQL Structure
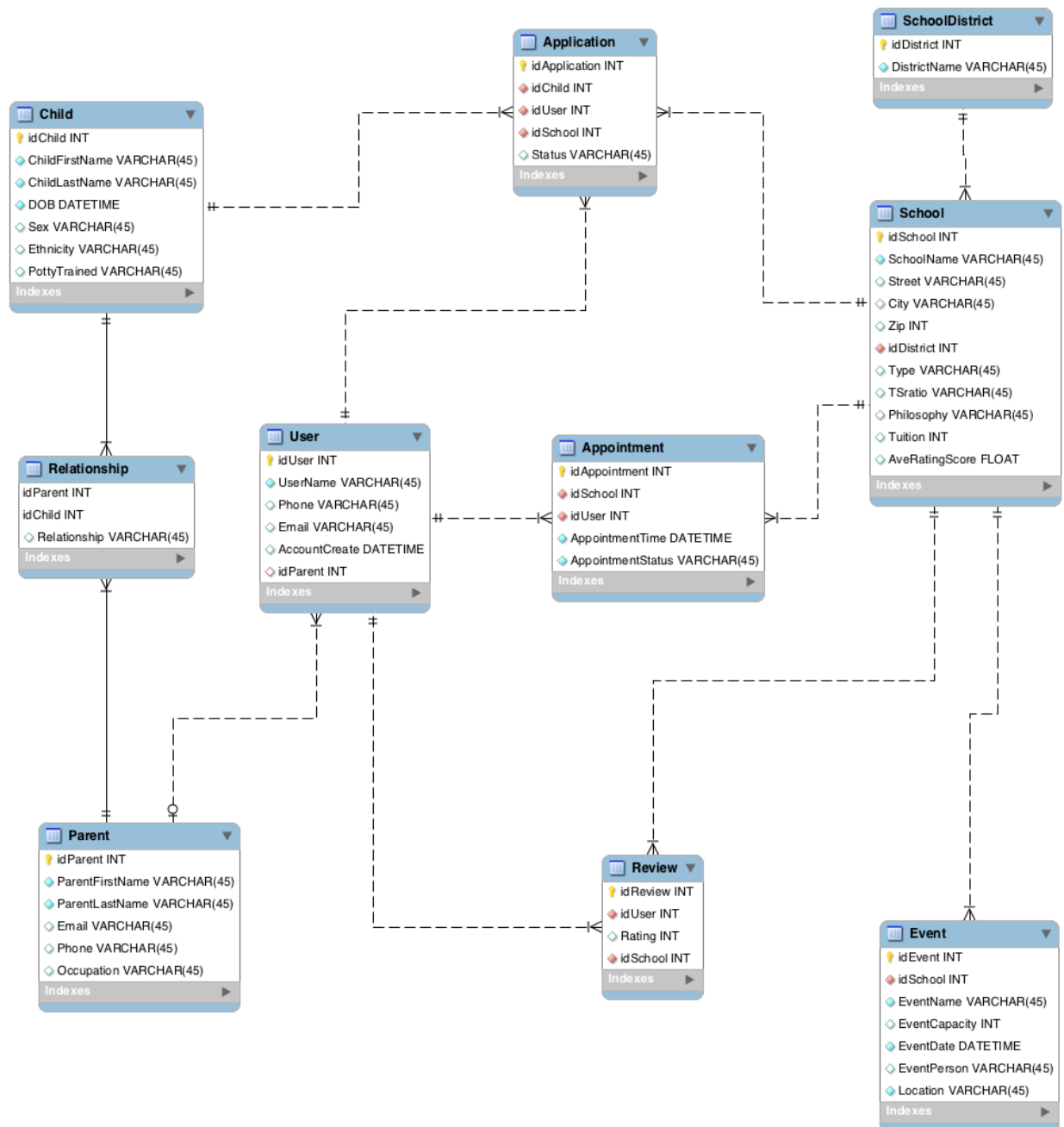
NoSQL Structure
Parents' reviews for preschools will be stored in NoSQL. Follwing are the reasons for store this user- generated contennt in NoSQL rather than MySQL:

1). No Transaction Requirement

2). Document oriented:eliminates the need to transfer data from rows to objects and back

3). High performance: can support heavy traffic

4). High availability: better user experience

5). High scalability: easier if we want to expand service to a nationwide level

Create database named coolkids, under that database, create a collection named review, then import the review contents.

```
ec2-user:~/environment $ mongoimport --collection review --db coolkids --file Review_NoSQL.csv --type csv --headerl
ine
2018-03-15T02:45:55.247+0000    connected to: localhost
2018-03-15T02:45:55.251+0000    imported 20 documents
ec2-user:~/environment $
```

5. Physical Schema – Database Dictionary

1) SchoolDistrict

SchoolDistrict			
Name	**Type**	**Constraint**	**Description**
idDistrict	INT	**PRIMARY KEY**	
DistrictName	VARCHAR(45)	NOT NULL, UNIQUE	

2) School

School			
Name	**Type**	**Constraint**	**Description**
idSchool	INT	**PRIMARY KEY,** AUTO INCREMENT	
SchoolName	VARCHAR(45)	NOT NULL	
Street	VARCHAR(45)		
City	VARCHAR(45)		
Zip	INT		
IdDistrict	INT	**FOREIGN KEY ,** NOT NULL	
Type	VARCHAR(45)		
TSratio	VARCHAR(45)		
Philosophy	VARCHAR(45)		
Tuition	INT		
AveRatingScore	FLOAT		

3) Event

School			
Name	**Type**	**Constraint**	**Description**
idEvent	INT	**PRIMARY KEY,** AUTO INCREMENT	
idSchool	INT	**FOREIGN KEY,** NOT NULL	
EventName	VARCHAR(45)	NOT NULL	
EventCapacity	INT		
EventDate	DATETIME		
EventPerson	VARCHAR(45)	NOT NULL	
Location	VARCHAR(45)		

4) Application

Application			
Name	**Type**	**Constraint**	**Description**
idApplication	INT	**PRIMARY KEY,** AUTO INCREMENT	
idChild	INT	**FOREIGN KEY**, NOT NULL	
idUser	INT	**FOREIGN KEY**, NOT NULL	
idSchool	INT	**FOREIGN KEY**, NOT NULL	
Status	VARCHAR(45)		

5) Appointment

Application			
Name	**Type**	**Constraint**	**Description**
idAppointment	INT	**PRIMARY KEY**	
idSchool	INT	**FOREIGN KEY**, NOT NULL	
idUser	INT	**FOREIGN KEY**, NOT NULL	
AppointmentTime	DATETIME	NOT NULL	
AppointmentStatus	VARCHAR(45)	NOT NULL	

6) Review

Review			
Name	**Type**	**Constraint**	**Description**
idReview	INT	**PRIMARY KEY**	
idUser	INT	**FOREIGN KEY**, NOT NULL	
Rating	INT		
idSchool	INT	**FOREIGN KEY**, NOT NULL	

7) User

User			
Name	**Type**	**Constraint**	**Description**
idUser	INT	**PRIMARY KEY**	
UserName	VARCHAR(45)	NOT NULL	
Phone	VARCHAR(45)		
Email	VARCHAR(45)		
AccountCreate	DATETIME		
idParent	INT	**FOREIGN KEY,** NOT NULL	

8) Parent

Parent			
Name	**Type**	**Constraint**	**Description**
idParent	INT	**PRIMARY KEY**	
ParentFirstName	VARCHAR(45)	NOT NULL	
ParentLastName	VARCHAR(45)	NOT NULL	
Email	VARCHAR(45)		
Phone	VARCHAR(45)		
Occupation	VARCHAR(45)		

9) Child

Child			
Name	**Type**	**Constraint**	**Description**
idChild	INT	**PRIMARY KEY**	
ChildFirstName	VARCHAR(45)	NOT NULL	
ChildLastName	VARCHAR(45)	NOT NULL	
DOB	DATETIME	NOT NULL	
Sex	VARCHAR(45)		
Ethnicity	VARCHAR(45)		
PottyTrained	VARCHAR(45)		

10)
Relationship

Relationship			
Name	**Type**	**Constraint**	**Description**
idChild	INT	**PRIMARY KEY**	
idParent	INT	**PRIMARY KEY**	
Relationship	VARCHAR(45)	NOT NULL	

6. Queries

Preschools

1. Create school profile on the platform. For example, a preschool in Alameda School District wants to create school profile
Before Insertion:

```sql
SELECT SchoolName, City, Philosophy FROM School JOIN SchoolDistrict ON School.idDistrict = SchoolDistrict.idDistrict
WHERE DistrictName = 'Alameda';
```

SchoolName	City	Philosophy
Bright Horizons at Garner	Alameda	education-based
The Child Unique Montessori School	Alameda	montessori
Rising Star Montessori School	Alameda	montessori
Tiny Treasures Preschool	Alameda	religious

Insert:

```sql
INSERT INTO School (SchoolName, Street, City, Zip, idDistrict, Type, TSratio, Philosophy, Tuition)
VALUES ('Fuzzy Caterpillar Preschool', '1510 Encinal Ave', 'Alameda', 94501, 1,'private', '20:1', 'play-based', 1580);
```

After Insertion:

```sql
SELECT SchoolName, City, Philosophy FROM School JOIN SchoolDistrict ON School.idDistrict = SchoolDistrict.idDistrict
WHERE DistrictName = 'Alameda';
```

SchoolName	City	Philosophy
Bright Horizons at Garner	Alameda	education-based
The Child Unique Montessori School	Alameda	montessori
Rising Star Montessori School	Alameda	montessori
Tiny Treasures Preschool	Alameda	religious
Fuzzy Caterpillar Preschool	Alameda	play-based

2. Make sure all appointments have been confirmed. For example, Congregation Beth Sholom Family Preschool wants to know if there's any appointment not confirmed yet.

```sql
SELECT Appointment.* FROM Appointment JOIN School ON Appointment.idSchool = School.idSchool
WHERE SchoolName = 'Congregation Beth Sholom Family Preschool' AND AppointmentStatus = 'pending';
```

idAppointme...	idSchool	idUser	AppointmentTime	AppointmentStatus ^
48	17	8266836	2018-03-01 10:00:00	pending

3. Announce events such as info sessions and open houses. For example, Bright Horizons at Garner is going to hold an info session on March 23 16:00 at Room 101.
Before Insertion:

```
SELECT idEvent, School.idSchool, SchoolName, EventName, EventDate FROM Event JOIN School ON Event.idSchool = School.idSchool
WHERE SchoolName = 'Bright Horizons at Garner';
```

idEvent	idSchool	SchoolName	EventName	EventDate
12	9	Bright Horizons at Garner	Open House	2017-06-01 11:00:00
15	9	Bright Horizons at Garner	Fund Raising	2017-12-01 10:00:00

Insert:

```
INSERT INTO Event (idSchool, EventName, EventCapacity, EventDate, EventPerson, Location)
VALUES (9, 'Info Session', 30, '2018/03/23 16:00' , 'Raj Das', 'Rm 101');
```

After Insertion:

```
SELECT idEvent, School.idSchool, SchoolName, EventName, EventDate FROM Event JOIN School ON Event.idSchool = School.idSchool
WHERE SchoolName = 'Bright Horizons at Garner';
```

idEvent	idSchool	SchoolName	EventName	EventDate
12	9	Bright Horizons at Garner	Open House	2017-06-01 11:00:00
15	9	Bright Horizons at Garner	Fund Raising	2017-12-01 10:00:00
20	9	Bright Horizons at Garner	Info Session	2018-03-23 16:00:00

4. Delete a cancelled event. For example, Bright Horizons at Garner is going to cancel the info session on March 23 16:00 at Room 101 because there are too few people attending.
Before deletion:

```
SELECT idEvent, School.idSchool, SchoolName, EventName, EventDate FROM Event JOIN School ON Event.idSchool = School.idSchool
WHERE SchoolName = 'Bright Horizons at Garner';
```

idEvent	idSchool	SchoolName	EventName	EventDate
12	9	Bright Horizons at Garner	Open House	2017-06-01 11:00:00
15	9	Bright Horizons at Garner	Fund Raising	2017-12-01 10:00:00
20	9	Bright Horizons at Garner	Info Session	2018-03-23 16:00:00

Delete:

```
DELETE FROM EVENT WHERE idEvent = 20;
```

After deletion:

```sql
SELECT idEvent, School.idSchool, SchoolName, EventName, EventDate FROM Event JOIN School ON Event.idSchool = School.idSchool
WHERE SchoolName = 'Bright Horizons at Garner';
```

idEvent	idSchool	SchoolName	EventName	EventDate
12	9	Bright Horizons at Garner	Open House	2017-06-01 11:00:00
15	9	Bright Horizons at Garner	Fund Raising	2017-12-01 10:00:00

Parents/Users
1. Search preschools information. For example, search preschool name and school district based on zip code 94502 and teaching philosophy Montessori.

```sql
SELECT SchoolName, DistrictName FROM School JOIN SchoolDistrict ON School.idDistrict = SchoolDistrict.idDistrict
WHERE Zip = 94502;
```

SchoolName	DistrictName
Bright Horizons at Garner	Alameda
The Child Unique Montessori School	Alameda
Rising Star Montessori School	Alameda

2. Schedule for school appointments. For example, user schedules an appointment to School Sarafi Kid.
   Before insertion:

```sql
SELECT Appointment.* FROM Appointment JOIN School ON Appointment.idSchool = School.idSchool
WHERE SchoolName = 'Sarafi Kid';
```

idAppointment	idSchool	idUser	AppointmentTime	AppointmentStatus
1	1	7727751	2017-03-01 10:00:00	confirmed
2	1	2292841	2017-04-01 14:00:00	pending
50	1	8658663	2017-03-01 10:00:00	confirmed

Insert:

```sql
INSERT INTO Appointment(idAppointment,idSchool,idUser,AppointmentTime, AppointmentStatus)
VALUES (95,1,7727751,'2017-03-21 12:00','pending');
```

After insertion:

```sql
SELECT SchoolName, DistrictName FROM School JOIN SchoolDistrict ON School.idDistrict = SchoolDistrict.idDistrict
WHERE Zip = 94502;
```

idAppointment	idSchool	idUser	AppointmentTime	AppointmentStatus
1	1	7727751	2017-03-01 10:00:00	confirmed
2	1	2292841	2017-04-01 14:00:00	pending
50	1	8658663	2017-03-01 10:00:00	confirmed
95	1	7727751	2017-03-21 12:00:00	pending

3. Update children's profile. For example, Lucas Zhao was potty trained so his parent wants to update this in his profile.
Before update:

```
SELECT * FROM Child Where idChild = 25;
```

idChild	ChildFirstName	ChildLastName	DOB	Sex	Ethnicity	PottyTrained
25	Lucas	Zhao	2014-08-09 00:00:00	Male	Asian	No

Update:

```
UPDATE Child SET PottyTrained = 'Yes'
WHERE idChild = 25;
```

After update:

```
SELECT * FROM Child Where idChild = 25;
```

idChild	ChildFirstName	ChildLastName	DOB	Sex	Ethnicity	PottyTrained
25	Lucas	Zhao	2014-08-09 00:00:00	Male	Asian	Yes

4. Review and rate for preschool. For example, a user wants to review Tiny Treasures Preschool.
Before Insertion:

```
SELECT Review.* FROM Review JOIN School ON Review.idSchool = School.idSchool
WHERE SchoolName = 'Tiny Treasures Preschool';
```

idReview	idUser	Rating	idSchool

Insert rating in MySQL:

```
INSERT INTO Review (idReview, idUser, Rating, idSchool)
VALUES (201,6646860 , 5, 13);
```

After Insertion:

```sql
SELECT Review.* FROM Review JOIN School ON Review.idSchool = School.idSchool
WHERE SchoolName = 'Tiny Treasures Preschool';
```

idReview	idUser	Rating	idSchool	
201	6646860	5	13	

Insert review in MongoDB:

```
> db.review.insertOne( {
...     id: 201,
...     Review: "Our family loves tiny treasures! Our son currently goes there and even though it was hard to get
 in (quite the battle of the darn waiting list) it was 100% worth it! My son LOVES his teacher Ms. Alex and LOVES
 another teacher Ms.Raizza. Ms. Alex always makes a point to talk to either my husband or myself whenever we pick
 up Bryce just to say good bye or tell us how good our son is. Clean facility, great teachers, happy kids, and we
 have yet to have a problem in the 7 months being there. We love tiny treasures!"
... } )
{
        "acknowledged" : true,
        "insertedId" : ObjectId("5aa9f02f00da03adc3578c0b")
}
```

School Districts

1. Maintain school information. For example, Santa Clara School District wants to make sure all information of schools within the district are correct.
   Step 1: Check if all school information in Santa Clara School District are correct

```sql
SELECT School.* FROM School JOIN SchoolDistrict ON School.idDistrict = SchoolDistrict.idDistrict
WHERE DistrictName = 'Santa Clara';
```

idSchool	SchoolName	Street	City	Zip	idDistrict	Type	TSratio	Philosophy	Tuition	AveRatingScore
1	Sarafi Kid	20100 Stevens Creek Blvd	Cupertino	94015	3	private	10 : 1	education-based	1200	4.3
20	Santa Clara Parents Nursery School	471 Monroe St	Santa Clara	95050	3	public	25 : 1	education-based	1650	1.3

Step 2: Correct wrong/updated school information by updating the record. For example, Santa Clara Parents Nersery School just changed it's teacher- to-student ratio to 20:1.

```sql
UPDATE School SET TSratio = '20:1'
WHERE idSchool = 20;
```

Step 3: View updated information

```sql
SELECT School.* FROM School JOIN SchoolDistrict ON School.idDistrict = SchoolDistrict.idDistrict
WHERE DistrictName = 'Santa Clara';
```

idSchool	SchoolName	Street	City	Zip	idDistrict	Type	TSratio	Philosophy	Tuition	AveRatingScore
1	Sarafi Kid	20100 Stevens Creek Blvd	Cupertino	94015	3	private	10 : 1	education-based	1200	4.3
20	Santa Clara Parents Nursery School	471 Monroe St	Santa Clara	95050	3	public	20:1	education-based	1650	1.3

2. Check total events held for all preschools in the School District. For example, San Mateo School District wants to know how many events each school has held for all time.

```
SELECT SchoolName, COUNT(Event.idSchool) AS 'Number of Events'
FROM Event JOIN School ON Event.idSchool = School.idSchool
JOIN SchoolDistrict ON School.idDistrict = SchoolDistrict.idDistrict
WHERE SchoolDistrict.DistrictName = 'San Mateo'
GROUP BY SchoolName;
```

SchoolName	Number of Events
Children's School HUMC	1
Serendipity Preschool	3
Trinity Lutheran Preschool	2

3. Search for reviews. For example, school district wants to search based on the keyword "recommend" to get a better idea of what parents prefer.

```
> db.review.find( { $text: { $search: "recommend" } })
{ "_id" : ObjectId("5aa9eca91a06957234f5584f"), "id" : 10, "Review" : "My daughter loves this place.  She loves a
ll the teachers, especially, Mrs. Reyes.  I highly recommend this place to any parents!" }
{ "_id" : ObjectId("5aa9eca91a06957234f5585a"), "id" : 120, "Review" : "I'm writing a review about the Jr. K room
 which I am thrilled about. The teacher is kind, fun, engaging, and provides enough structure and play-based lear
ned to keep my bright daughter learning and happy.  The Director and her staff are a great team.  You can tell th
at they get along well and I admire how they listen to new ideas, offer flexibility to working parents, and treat
 the kids (*and* parents) with kindness and respect. My daughter has been there for approximately 2.5yrs with a s
hort break due to a job in another area.  I recommend this school to parents who want a strong curriculum with Ch
ristian faith upbringing." }
{ "_id" : ObjectId("5aa9eca91a06957234f55851"), "id" : 30, "Review" : "My twins attended the 2-day class during t
he 2015-2016 school year; we just loved Sanyoo's care. empathy, and teachings for all of the students. The play-b
ased curriculum is awesome for pre-schoolers to have an environment to thrive and learn. We enjoyed volunteering
with other parents during the class time to help out around the scoolroom/yard (and also get to peek on our kids
developing social skills and playtime with others). \r\rWe especially enjoyed the rotating science projects, art
projects and other hands-on activities...many were a first for my kids. I highly recommend any pre-school age chi
ldren from 2.5yrs old to 4.5yrs old to attend APPS for pre-school!" }
```

7. Index

create index schoolID on school (idSchool);
create index districtID on SchoolDistrict (idDistrict);
create index reviewID on Review (idReview);

8. Triggers

```sql
CREATE TRIGGER computeAvgRating
AFTER INSERT ON Review
FOR EACH ROW
    UPDATE School
    SET AveRatingScore = (SELECT AVG(Rating) FROM Review
                WHERE School.idSchool = Review.idSchool)
    WHERE idSchool = NEW.idSchool;
```

Before:

idSchool	avg(Rating)
1	3.6000

Update:

INSERT INTO Review(idReview,idUser,idSchool,Rating)
VALUES (270,7590782,1,1);

After:

idSchool	avg(Rating)
1	3.1667

9. Views

```sql
CREATE VIEW SchoolnDistrict AS
SELECT S.SchoolName, D.DistrictName,S.TSratio,S.Philosophy, S.Tuition, S.AveRatingScore
from School S join SchoolDistrict D on S.idDistrict=D.idDistrict;
```

SchoolName	DistrictName	TSratio	Philosophy	Tuition	AveRatingSc... ⌄
HeadsUp! Child Development Center	San Jose	10 : 1	montessori	2360	4
Trinity Lutheran Preschool	San Mateo	24 : 1	religious	1200	4
Sarafi Kid	Santa Clara	10 : 1	education-based	1200	3.16667
Children's School HUMC	San Mateo	25 : 1	cooperative	500	3
Congregation Beth Sholom Family Pr...	San Fransisco	15 : 1	reggio-emelia, re...	1960	2.5
Learning Links Preschool	Mountain View	10 : 1	play-based	1500	2
Sequoia Preschool and Kindergarten	Redwood City	10 : 1	play-based	3600	2
Almaden Country School	San Jose	15 : 1	reggio-emelia	1250	2
Kangaroos Glen Park	San Fransisco	10 : 1	play-based	2000	1.5
Santa Clara Parents Nursery School	Santa Clara	25 : 1	education-based	1650	1.3

10. Business Metrics

1. School Districts track average rating score for all preschools in the District. For example, San Mateo District wants to know the average rating for all preschools in the district.

```sql
SELECT SchoolName,AveRatingScore FROM School JOIN SchoolDistrict ON SchoolDistrict.idDistrict = School.idDistrict
WHERE SchoolDistrict.DistrictName = 'San Mateo';
```

SchoolName	AveRatingScore
Trinity Lutheran Preschool	4
Children's School HUMC	3
Serendipity Preschool	NULL

AverageRatingScore
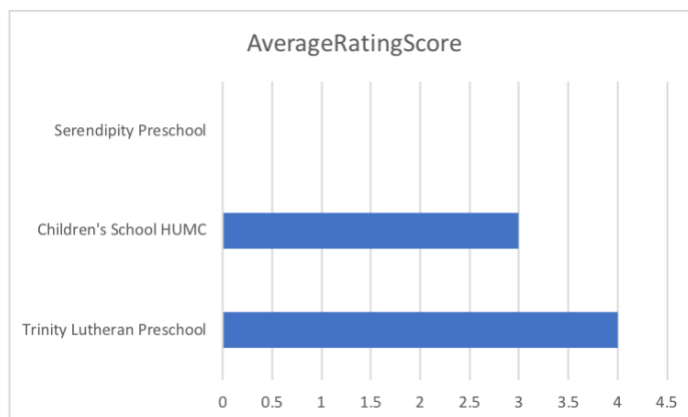
2. School Districts get an idea of how many applications all preschools received via the platform. For example, San Mateo School District gets an idea of how many applications each school in the district gets via the platform.

```sql
SELECT SchoolName, COUNT(Application.idApplication) AS 'Number of Applications' FROM Application
JOIN School ON Application.idSchool = School.idSchool
JOIN SchoolDistrict ON SchoolDistrict.idDistrict = School.idDistrict
WHERE SchoolDistrict.DistrictName = 'San Mateo'
GROUP BY SchoolName;
```

SchoolName	Number of Applications
Children's School HUMC	4
Serendipity Preschool	2
Trinity Lutheran Preschool	6

Number of Applications
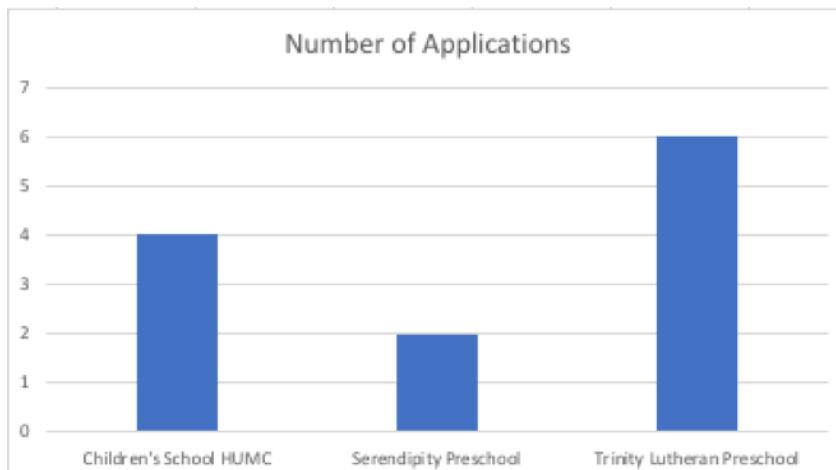
3. Preschools track how many appointments there are by month via the platform. For example, Sarafi Kid wants to know how many appoints they received by month.

```sql
SELECT CONCAT(YEAR(AppointmentTime), '/ ',  MONTH(AppointmentTime))AS 'Month',
COUNT(Appointment.idAppointment) 'Number of Application'
FROM Appointment JOIN School ON Appointment.idSchool = School.idSchool
WHERE School.SchoolName = 'Sarafi Kid'
GROUP BY 1;
```

Month	Number of Application
2017/ 3	3
2017/ 4	1

Number of Application
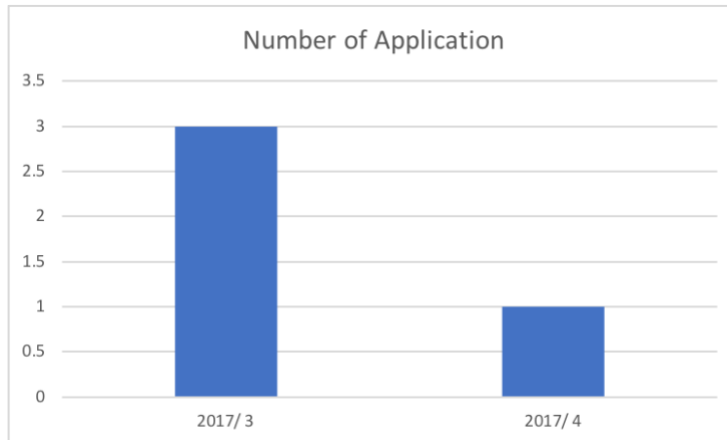
4. Parents track monthly tuition and rating of all preschools in one school district. For example, a parent wants to track the monthly tuition and rating of all preschools in San Francisco.

```
SELECT SchoolName, Tuition, AveRatingScore FROM School
JOIN SchoolDistrict ON SchoolDistrict.idDistrict = School.idDistrict
WHERE DistrictName = 'San Francisco';
```

SchoolName	Tuition	AveRatingScore
Bambini Montessori School	2000	NULL
Congregation Beth Sholom Family Preschool	1960	2.5
Cow Hollow School	1500	NULL
Kangaroos Glen Park	2000	1.5

Tuition of Preschools in San Francisco District

Average Rating Score of Preschools in San Francisco District
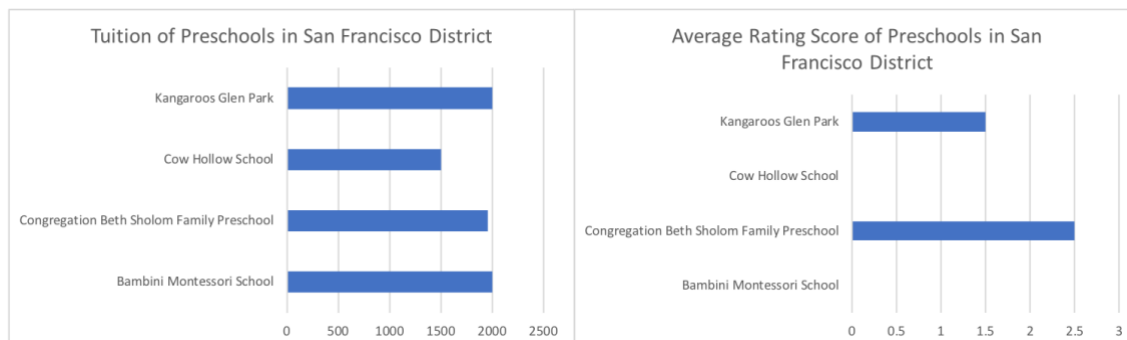
11. Project Summary

11.1 Summarize your experience with this exercise
This exercise provides us with hands on experience of topics that we covered in this quarter. It especially helps us getting to know how to design view and interact with NoSQL, which are conceptually hard to understand.

11.2 What was the hardest part of this project?
The hardest part of this project is the initial scope. To start with, finding a business problem suitable for the project is challenging. There are so many companies and startups out there working on all kinds of business problems and it took us a while to find a problem that's not being fully tackled yet. Further, it is also hard to define users and use cases as we are not that familiar with preschools at the beginning so trying to cover all aspects of stakeholders is hard as well.

11.3 What problems did you run against in this project?
Drawing the swimlane was giving us a problem as we were having troubles figuring out the logics.It also took us a while to deep dive into NoSQL to figure out how to realize the use cases.

11.4 How did you solve these problems?
We went through the uses cases several times trying to cover as much as possible on what users can do with the platform, as well as to draw a reasonable swim lane diagram.

11.5 If you were to do this project again, what methodology would you follow?
If NoSQL is optional, we would design the whole system in MySQL. Even though it might sacrifice performance and availability, having everything in MySQL should work out fine and some queries would be easier with the current scale.
Also, we would put extra thoughts on designing the data models. We spent a lot of time trying to revise the columns and constraints and if we can plan more carefully ahead, we would save more time.

11.6 Suggestions for how to refine this project for the next class?
Our suggestion is to make NoSQL optional for the project. It is nice to have this option as some groups might need to store documents such as images, however, for groups that does not necessarily need NoSQL, having everything in MySQL would make the entire workflow more efficient.