Requirements specification for Teaching Children in Kindergarten business process

1. General description of business process

a. **General Description of the Business Process:**
The process of teaching children at "Sunshine Kids" kindergarten begins with educators designing and implementing engaging learning activities across various domains such as cognitive, social, and emotional development. Progress is monitored regularly to assess learning outcomes. Additionally, attendance is strictly monitored.

Increase the average grade by a level of 2% from each subject every month comparing to the previous month.
Increase in the average attendance by a level of 0.5% monthly comparing to the previous month.

b. Typical questions:
- Compare the learning progress of children based on attendance.
- Compare the results of children across different disciplines.
- Identify top 10% children considering results from all the tests.
- Identify the most effective teachers based on monthly test results.
- Compare the results between years
- Analyze the correlation between grades in various learning domains.

c. **Data:**
All data related to students, teachers, courses and attendance are extracted from the internal system “Sunshine Learning Portal”. In addition, data about grades from each test is stored in the csv file.

2. Data sources structures

“Sunshine Learning Portal”

TABLE NAME	ATTRIBUTE	ATTRIBUTE TYPE	DESCRIPTION
Students	List of all students		
	student_ID	Int	PK - ID of student

	student_ name	String characters - 20	Student name
	student_ surname	String characters - 20	Student surname
	student_ date_of_ birth	Date	Student date of birth
	student_ gender	String characters - 10	Student gender
	student_ address	String characters - 50	Student address
	parents_ contact	String characters - 30	Contact to student's parents
	FK_grou p_ID	Int	FK
Teachers	List of all teachers		
	teacher_I D	Int	PK - ID of teacher
	teacher_ name	String characters - 20	Teacher name
	teacher_ surname	String characters - 20	Teacher surname
	teacher_ date_of_ birth	Date	Teacher date of birth
	teacher_ gender	String characters - 10	Teacher gender
	working_ since	Date	Date since the teacher is teaching

	teacher_contact	String characters - 30	Contact to teacher
Groups	Groups of students in kindergarten		
	group_ID	Int	PK - ID of group
	group_name	String characters - 30	Name of group
	starting_year	Int	Year when the group was created
	FK_teacher_ID	Int	FK
Courses	Subject for the group		
	course_ID	Int	PK – ID of course
	name_of_course	String characters - 30	Name of the course
	course_year	Int	Year in which course takes place
	FK_teacher_ID	Int	FK
Tests	Tests from courses		
	test_ID	Int	PK- ID of test
	date_of_test	String characters - 15	Date of test
	FK_course_ID	Int	FK
Classes	Tutorials which take place in the day		
	class_ID	Int	PK-ID of class

	day_of_week	Straing characters- 10	Day in which tutorials are
	start_hour	Time	Start of the tutorials
	end_hour	Time	End of the tutorials
	year_of_classes	String characters - 9	
	FK_group_ID	Int	FK
	FK_course_ID	Int	FK
Attendance	Attendance of every student		
	attendance_ID	Int	PK-ID of attendance
	presence	String characters - 5	Present or not
	attendance_date	Date	Date of the attendance
	FK_student_ID	Int	FK
	FK_class_ID	Int	FK

Teachers(<u>teacher_ID</u>, teacher_name, teacher_surname, teacher_date_of_birth, teacher_gender, teacher_address, teacher_working_since, teacher_contact)

Groups(<u>group_ID</u>, group_name, sarting_year, supervising_teacher_ID REF Groups)

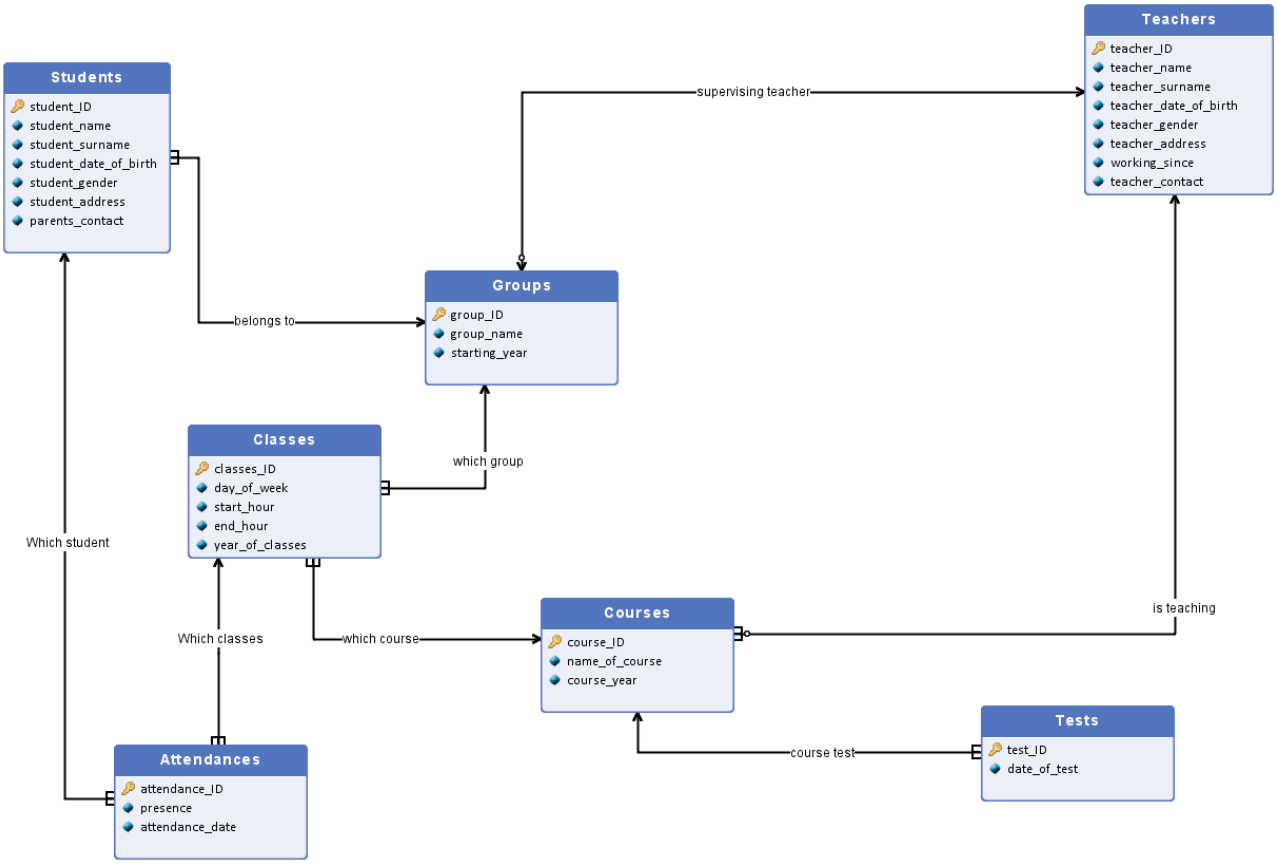
Students(<u>student_ID</u>, student_name, student_surname, student_date_of_birth, student_gender, student_address, parents_contact, group_ID REF Groups)

Courses(<u>course_ID</u>, name_of_course, course_year, teacher_ID REF Teachers)

Tests(test_ID, date_of_test, course_ID REF Courses)

Classes(class_ID, day_of_week, start_hour, end_hour, year_of_classes, group_ID REF Groups, course_ID REF Courses)

Attendances(attendance_ID, presence, attendance_date, student_ID REF Students, class_ID REF Classes)



Grades CSV

(Information about grades of the students for tests, line 1 is a header row)

COLUMN 1 (id) - Grade identification number (unique numeric value)

COLUMN 2 (*student_id*) - Student identification number (unique numeric value, used also in the database)

COLUMN 3 (*test_id*) - Test identification number (unique numeric value, used also in the database)

COLUMN 4 (*grade*) - Grade obtained by the student (value from 1 to 10)

COLUMN 5 (*percentage*) – Percentage score obtained by the student (value from 0 to 100)

COLUMN 6 (*writing_time*) – Writing time (value in percentage from 0 to 100)

COLUMN 7 (*attempt_num*) – Attempt number (1 or 2)

3. Scenarios of analytical problems

Why was there an increase/decrease in the tests average score this month?

1. Show courses in which the average test score has decreased during month.
2. Show groups in which the average test score has decreased during month.
3. Show top 10 students within each year with the best average grade (from all tests combined) from previous and current month.
4. Compare the average test results of different groups within the same year (within one starting year each group gets the approximately the same test).
5. Compare grades of 10 students with highest attendance level from each test within last month with the average percentage score from that test.
6. Compare the grades of students which live more than 20km from kindergarten with those who do not.
7. Show top 3 students with best percentage score for every test within last month.

Why was there an increase/decrease in the average attendance score this month?

1. Which group within each year had the best average attendance in current and previous month?
2. Show groups in which the average attendance level has decreased since last month.
3. Show 3 students with the worst average attendance level within last month.
4. Show top 10 students within each year with the best average attendance from previous and current month.
5. Compare the average attendance of different groups within the same year.
6. For each group show course which has the lowest average attendance level for this month.
7. Show 5 students with the best average attendance level within last month.
8. Which group within each year had the worst average attendance in current month?
9. Compare the average response of the surveys about attending classes from this month with the previous month.

4.Data needed for analytical problem

Why was there an increase/decrease in the tests average score this month?

1. Show courses in which the average test score has decreased during month.
   - **Course Name** - *Sunshine Learning Portal*, *Course* table, *name_of_course* column
   - **Test ID** - *Sunshine Learning Portal*, *Test* table, *Test_ID* column
   - **Test ID** - *Grades CSV*, *test_id* column
   - **Average percentage score –** *Grades CSV*, *percentage* column
2. Show groups in which the average test score has decreased during month.
   - **Average percentage score –** *Grades CSV*, *percentage* column
   - **Student ID -** *Grades CSV*, student ID column
   - **Group ID -** *Sunshine Learning Portal*, *Groups* table, Group_*ID* column
   - **Student ID -** *Sunshine Learning Portal*, *Students* table, *Student_ID* column

- **Test ID -** *Sunshine Learning Portal*, *Test* table, *Test_ID* column
- **Test ID** - *Grades CSV*, *test_id* column

3. Show top 10 students within each year with the best average grade (from all tests combined) from previous and current month.
   - **Average percentage score –** *Grades CSV*, *percentage* column
   - **Starting year –** *Sunshine Learning Portal*, *Groups* table, *starting_year* column
   - **Student ID -** *Grades CSV*, student ID column
   - **Student ID -** *Sunshine Learning Portal*, *Students* table, *Student_ID* column
4. Compare the average test results of different groups within the same year (within one starting year each group gets the approximately the same test).
   - **Average percentage score –** *Grades CSV*, *percentage* column
   - **Starting year –** *Sunshine Learning Portal*, *Groups* table, *starting_year* column
   - **Student ID -** *Grades CSV*, student ID column
   - **Student ID -** *Sunshine Learning Portal*, *Students* table, *Student_ID* column
   - **Group ID -** *Sunshine Learning Portal*, *Groups* table, Group_*ID* column
   - **Test ID** - *Grades CSV*, *test_id* column
5. Compare grades of 10 students with highest attendance level from each test within last month with the average percentage score from that test.
   - **Percentage score –** *Grades CSV*, *percentage* column
   - **Student ID -** *Grades CSV*, student ID column
   - **Student ID -** *Sunshine Learning Portal*, *Students* table, *Student_ID* column
   - **Group ID -** *Sunshine Learning Portal*, *Groups* table, Group_*ID* column
   - **Test ID** - *Grades CSV*, *test_id* column
   - **Student ID -** *Sunshine Learning Portal*, *Which student table*, *Student_ID* column
   - **Attendance ID -** *Sunshine Learning Portal*, *Attendance table*, *Attendance_ID* column
6. Compare the average grade of students which live more than 20km from kindergarten with those who do not.
   - **Percentage score –** *Grades CSV*, *percentage* column
   - **Student ID -** *Grades CSV*, student ID column
   - **Student ID -** *Sunshine Learning Portal*, *Students* table, *Student_ID* column
   - **Address -** *Sunshine Learning Portal*, *Students* table, Address *column*
   - **Distance to kindergarten** – there's no such information available in both data sources. The proposals for acquiring such information:
     - enhance Students table in Sunchine Learning Portal with distance to kindergarten
     - distance analysis with the use of tools like google maps
7. Show top 3 students with best percentage score for every test within last month.
   - **Percentage score –** *Grades CSV*, *percentage* column
   - **Student ID -** *Grades CSV*, student ID column
   - **Student ID -** *Sunshine Learning Portal*, *Students* table, *Student_ID* column
   - **Test ID** - *Grades CSV*, *test_id* column

Why was there an increase/decrease in the average attendance score this month?

1. Which group within each year had the best average attendance in current and previous month?
    - **Attendance ID -** *Sunshine Learning Portal*, *Attendance table*, a*ttendance_ID* column
    - **Date -** *Sunshine Learning Portal*, *Attendance table*, *date* column
    - **Presence -** *Sunshine Learning Portal*, *Attendance table*, *presence* column
    - **Classes ID -** *Sunshine Learning Portal*, *Classes* table, *classes_ID* column
    - **Group ID** - *Sunshine Learning Portal*, *Group* table, group_*ID* column
    - **Group Name -** *Sunshine Learning Portal*, *Group* table, group_*name* column
2. Show groups in which the average attendance level has decreased since last month.
    - **Attendance ID -** *Sunshine Learning Portal*, *Attendance table*, a*ttendance_ID* column
    - **Date -** *Sunshine Learning Portal*, *Attendance table*, *date* column
    - **Presence -** *Sunshine Learning Portal*, *Attendance table*, *presence* column
    - **Classes ID -** *Sunshine Learning Portal*, *Classes* table, *classes_ID* column
    - **Group ID** - *Sunshine Learning Portal*, *Group* table, group_*ID* column
    - **Group Name -** *Sunshine Learning Portal*, *Group* table, group_*name* column
3. Show 3 students with the worst average attendance level within last month.
    - **Attendance ID -** *Sunshine Learning Portal*, *Attendance table*, a*ttendance_ID* column
    - **Date -** *Sunshine Learning Portal*, *Attendance table*, *date* column
    - **Presence -** *Sunshine Learning Portal*, *Attendance table*, *presence* column
    - **Student ID -** *Sunshine Learning Portal*, *Students table*, *student_ID* column
    - **Name -** *Sunshine Learning Portal*, *Students table*, name *column*
    - **Surname -** *Sunshine Learning Portal*, *Students table*, *surname* column
4. Show top 10 students within each year with the best average attendance from previous and current month.
    - **Attendance ID -** *Sunshine Learning Portal*, *Attendance table*, a*ttendance_ID* column
    - **Date -** *Sunshine Learning Portal*, *Attendance table*, *date* column
    - **Presence -** *Sunshine Learning Portal*, *Attendance table*, *presence* column
    - **Student ID -** *Sunshine Learning Portal*, *Students table*, *student_ID* column
    - **Name -** *Sunshine Learning Portal*, *Students table*, name *column*
    - **Surname -** *Sunshine Learning Portal*, *Students table*, *surname* column
    - **Group ID** - *Sunshine Learning Portal*, *Group* table, *group_ID* column
    - **Starting Year** - *Sunshine Learning Portal*, *Group* table, *starting_year* column
5. Compare the average attendance (for this month) of different groups within the same year.
    - **Attendance ID -** *Sunshine Learning Portal*, *Attendance table*, a*ttendance_ID* column
    - **Date -** *Sunshine Learning Portal*, *Attendance table*, *date* column

- **Presence -** *Sunshine Learning Portal*, *Attendance table*, *presence* column
- **Classes ID -** *Sunshine Learning Portal*, *Classes* table, *classes_ID* column
- **Group ID** - *Sunshine Learning Portal*, *Group* table, group_*ID* column
- **Group Name -** *Sunshine Learning Portal*, *Group* table, group_*name* column
- **Starting Year** - *Sunshine Learning Portal*, *Group* table, *starting_year* column

6. For each group show course which has the lowest average attendance level for this month.
   - **Attendance ID -** *Sunshine Learning Portal*, *Attendance table*, a*ttendance_ID* column
   - **Date -** *Sunshine Learning Portal*, *Attendance table*, *date* column
   - **Presence -** *Sunshine Learning Portal*, *Attendance table*, *presence* column
   - **Class ID -** *Sunshine Learning Portal*, *Classes* table, *classes_ID* column
   - **Group ID** - *Sunshine Learning Portal*, *Group* table, group_*ID* column
   - **Group Name -** *Sunshine Learning Portal*, *Group* table, group_*name* column
   - **Course ID -** *Sunshine Learning Portal*, *Courses* table, course_*ID* column
7. Show 5 students with the best average attendance level within last month.
   - **Attendance ID -** *Sunshine Learning Portal*, *Attendance table*, a*ttendance_ID* column
   - **Date -** *Sunshine Learning Portal*, *Attendance table*, *date* column
   - **Presence -** *Sunshine Learning Portal*, *Attendance table*, *presence* column
   - **Student ID -** *Sunshine Learning Portal*, *Students table*, *student_ID* column
   - **Name -** *Sunshine Learning Portal*, *Students table*, name *column*
   - **Surname -** *Sunshine Learning Portal*, *Students table*, *surname* column
8. Which group within each year had the worst average attendance in current month?
   - **Attendance ID -** *Sunshine Learning Portal*, *Attendance table*, a*ttendance_ID* column
   - **Date -** *Sunshine Learning Portal*, *Attendance table*, *date* column
   - **Presence -** *Sunshine Learning Portal*, *Attendance table*, *presence* column
   - **Classes ID -** *Sunshine Learning Portal*, *Classes* table, *classes_ID* column
   - **Group ID** - *Sunshine Learning Portal*, *Group* table, group_*ID* column
   - **Group Name -** *Sunshine Learning Portal*, *Group* table, group_*name* column
9. Compare the average response of the surveys about attending classes from this month with the previous month.

It is not possible to build a BI system to create this query without introducing changes in the kindergarten. We suggest introducing a survey that will be send to all parents every month. It should contain following questions:

- How do you rate the willingness to attend classes of your child in the last month (from 0 to 10)?
- How would you rate the overall atmosphere and environment of the kindergarten in fostering a positive attitude towards learning? (from 0 to 10)
- How would you describe your child's mood after returning home from school? (Options: Happy, Neutral, Tired, Upset)

- Are there any concerns or suggestions you would like to share regarding the way classes are conducted?

This questionnaire is available for parents in the app of the system *Sunshine Learning Portal,* after filling by parents it is sent and stored in the csv file.

Sample structure of the csv file:

QUESTIONAIRES CSV

(Information about results of the questionnaires, line 1 is a header row)

COLUMN 1 (*student_id*) - id of the student which parents filled the questionnaire

COULMN 2 (timestamp) - date of sending the survey

COULUMN 3 (q1_answer) - answer for the first question from a survey (numeric value 0-10)

COULUMN 4 (q2_answer) - answer for the second question from a survey (numeric value 0-10)

COULUMN 5 (q3_answer) - answer for the third question from a survey (Options: Happy, Neutral, Tired, Upset)

COULMN 6 (q4_answer) - answer for the fourth question from a survey (text value)