Paper 198-27
Algorithmic Answers for a Dance School Dilemma

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Abstract

This project provided a SAS solution to a unique and recurring need for both summary student information and billing capability under varying scenarios encountered by an educational entity. The Dance School provides instruction for a variety of performing arts modalities, including ballet, jazz, tap, and modern dance. The two major objectives were: (1) to enhance the ability to track and summarize student information, and (2) to accurately and timely calculate a pricing summary for each student. An algorithmic decision tree was constructed to address these needs, Utilizing the decision tree, SAS version 8 code was developed to produce the desired output. The six algorithmic factors included: (1) type of class (ballet, jazz, tap, modern); (2) number of siblings, (3) number of classes taken per week; (4) pricing schedule per class (progressive volume discount, family discount); (5) type of registration (individual, family); and (6) quarterly term of instruction (1-4). The SAS code, as constructed, generates both descriptive measures for Dance School management, and calculates a total price [per student per term]. This project illustrates the versatility of SAS programming in a unique educational environment.

Introduction

Transactions consist of 'exchanges of assets and services between an entity and outside parties' (2001, Boynton et al, p.334). Representative of contemporary business practice, there are six transaction cycles within an accounting information system: (1) Revenue, (2) Expenditure, (3) Personnel Services, (4) Production, (5) Investing, and (6) Financing (2001, Boynton et al, p. 308). This project focused on the first transaction cycle, Revenue, for an educational entity. During the Revenue cycle, three major classes of transactions occur: Sales, Cash Receipts, and Sales Adjustments. The SAS algorithm produced by the Author provided a summary of student dance activities to ensure the appropriate cash receipt amount was assigned to each student.

Purpose

The purpose of this project was to create a SAS algorithm to track and display student information, and to accurately calculate a pricing summary for each student within an educational entity system.

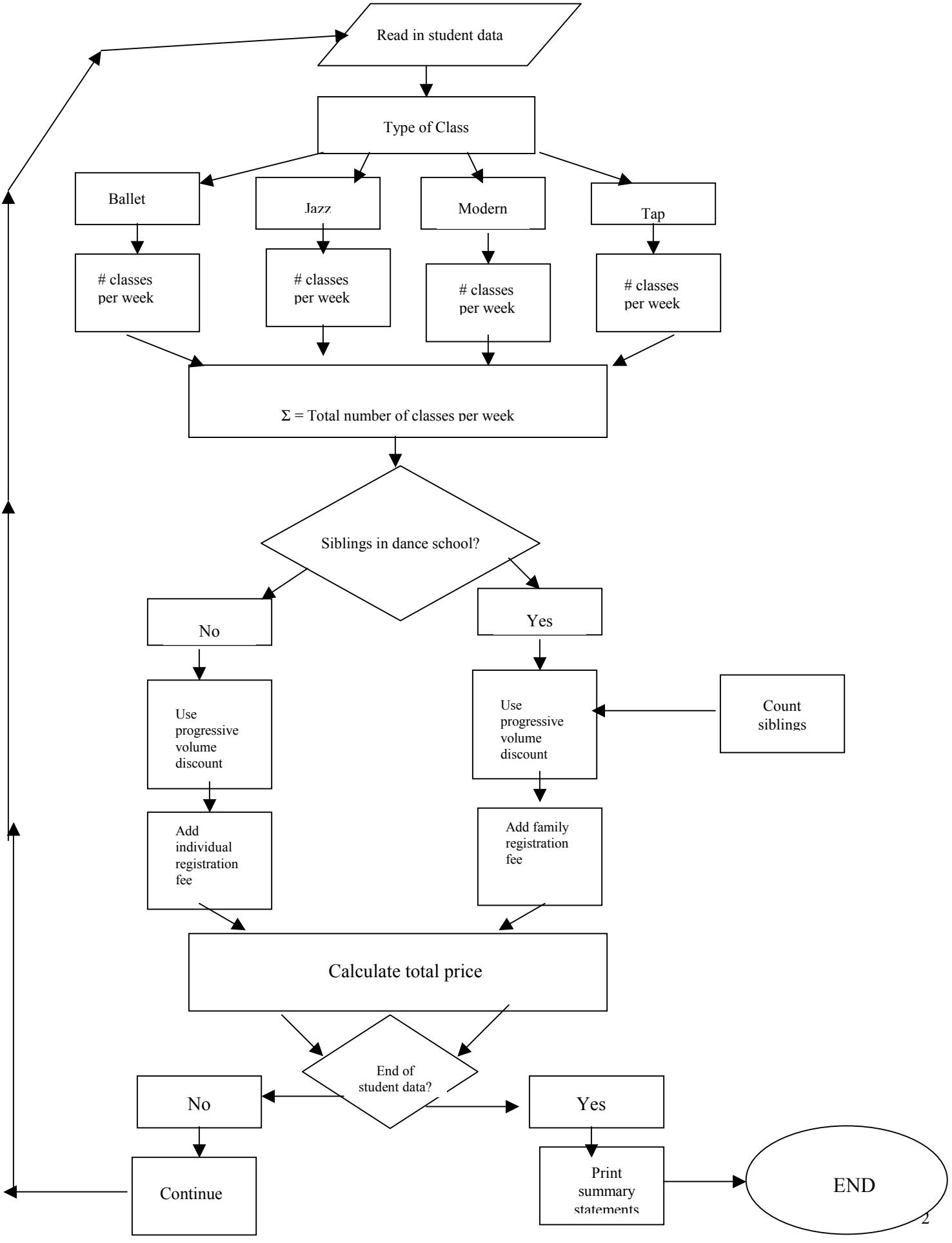
Description of Educational Entity System

The educational entity described by this project is a private Dance School in Florida. The Dance School offers professional instruction in four major types of dance: Ballet, Jazz, Modern, and Tap. While Dance School students range in age from Pre-Kindergarten to senior citizens, the majority of students are between 5 and 18 years old. Beginning students generally take one to two classes per week depending on age and prior dance experience. Advanced students typically take more than one dance class per week, and take more than one type of Dance instruction as well. Registration for dance instruction is divided into 4 terms per year, with each term consisting of ten weeks of instruction. A progressive volume discount is employed, so as the number of classes taken per student per week increases, the cost per class decreases. Students who have siblings attending the Dance School receive two types of discounts: (1) a family registration fee is assigned rather than the Individual registration fee, and (2) the progressive volume class fee schedule applies to the combined siblings' class load.

The structure of the SAS algorithm constructed is shown in Figure 1, Algorithmic Flowchart.
As shown in Figure 1, the initial task was to read in the student data. Next, the number of classes per week per dance type is aggregated to create a new variable, total classes taken per week:

```
TOTCLASS = BCLASS + JCLASS + MCLASS + TCLASS .
```

ALGORITHMIC FLOWCHART



Next the number of siblings enrolled in the Dance School is calculated, and based on the presence or absence of siblings the appropriate registration fee is applied. Using the progressive volume discount based on number of classes taken, the total price per student is calculated. If this is the last student, a summary is printed of the amount owed per student. If there is additional student data, the algorithmic activity continues until all student data has been included.

Observed student variable values for TOTCLASS were processed by using IF-THEN statements to select observations meeting specific criteria. Because the progressive volume discount did not evenly decline by a fixed percentage over the range of TOTCLASS values, a series of IF-THEN statements was utilized:

```
if totclass=1 then price=10;
if totclass=2 then price=9;
if totclass=3 then price=8.5;
if totclass=4 then price=8;
if totclass=5 then price=7.5;
if totclass=6 then price=7;
if totclass=7 then price=6.5;
if totclass=8 then price=6.25;
if totclass=9 then price=5.75;
```

As shown, any student who enrolls for more than 9 classes a week is charged a flat rate of $5.75 per class.

After the price was calculated using the IF-THEN statements, a total price for each student was calculated:

```
totprice=10*totclass*price;
```

A multiplicative constant of 10 was used to represent the 10 weeks of instruction.

After TOTPRICE was calculated, the corresponding registration fee was selected using IF-THEN statements. Lastly, a billing (price) amount was calculated as shown below.

```
if numsib = 0 then regfee  = 15;
if numsib = 1 then regfee = 30;
billpric = totprice + regfee;
```

A sample portion of the SAS output is included here:

Obs	Numsib	Totclass	Price	Totprice	Billpric
1	0	3	8.5	255	270
2	0	1	10.0	100	115
3	0	1	10.0	100	115
4	0	1	10.0	100	115
5	0	3	8.5	255	270
6	0	3	8.5	255	270
7	0	1	10.0	100	115
8	0	1	10.0	100	115
9	0	6	7.0	420	435
10	0	1	10.0	100	115
11	0	1	10.0	100	115
12	0	1	10.0	100	115
13	0	1	10.0	100	115
14	0	4	8.0	320	335
15	0	1	10.0	100	115
16	0	1	10.0	100	115
17	0	1	10.0	100	115
18	0	7	6.5	455	470
19	0	1	10.0	100	115
20	0	1	10.0	100	115

A summary of the system variables and the corresponding SAS variable name is shown below in Table 1, Algorithm Variable Assignments.

Table 1. Algorithmic Variable Assignments

System Variable	SAS Variable Name	Type of Variable
Billing amount	BILLPRIC	quantitative
Family number	FAMNUM	quantitative
Gender	GENDER	categorical, assigned
No. of Siblings	NUMSIB	quantitative
Price per class	PRICE	quantitative
Registration fee	REGFEE	quantitative
Student Number	STUDNUM	quantitative
Total classes taken per week	TOTCLASS	quantitative
Total price	TOTPRICE	quantitative
Type of dance class	TYPCLASS	categorical
	BCLASS = "BALLET"	
	JCLASS = "JAZZ"	
	MCLASS = "MODERN"	
	TCLASS = "TAP"	

Summary

SAS programming, as detailed herein, provided an algorithmic "answer" for a unique educational entity. Within the Dance School, there were many possible combinations of the six algorithmic factors: type of class, number of siblings, number of classes taken per week, pricing per class, type of registration, and quarterly term of instruction.

Using the SAS algorithm constructed by the Author, summary and billing information is now readily calculated to ensure a consistently accurate Revenue stream. The ability to create a new way of knowing showcases the versatility of SAS for unique applications.

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