

Database Management for Large Courses and Non-Technical Users

Martha Lindberg
Computer and Information Science Department
Minnesota State University, Mankato
martha.lindberg@mnsu.edu

Abstract

At Minnesota State University, Mankato, the Music Department offers general education courses in large lecture sections. Keeping records for these courses consumed too much time - time that could be better spent teaching music. The Music Department looked for a database management system for help. Musicians would maintain the database; thus, a prime consideration for the database software was how easy it is for non-technical users.

A FileMaker Pro database was made to store records and automatically calculate grades. This improved course management, but graduate students still had to spend many hours manually entering student names and exam scores into the database. Improvements were made to the design, including a portal to a second database, better use of layouts, and automatic data importing.

This paper discusses design considerations in creating a course database for non-technical users and how a database compares to using an online instructional management system.

Introduction

Two of the most popular music classes at Minnesota State University, Mankato are “Introduction to Music,” and “Jazz, Pop and Rock,” taught by Dr. Gerard Aloisio. Each semester, approximately 900 students enroll in these courses. Student grades are based on exam scores and outside concert attendance. After spending an overwhelming amount of time entering and calculating grades for the first few semesters that the courses were offered, the Music Department wanted some sort of system to make the process more efficient for Dr. Aloisio.

First Attempt at Course Record Management

Considerations in Choosing a Database Management System

The department considered two popular databases, Microsoft Access and FileMaker Pro by FileMaker, Inc., a subsidiary of Apple Computer, Inc. [1]. Access is included in most business versions of the Microsoft Office Suite. One advantage of Access would be that most MSU faculty computers are PC-compatible, and they come with the Microsoft Office Suite already installed. The department would not have to purchase additional software if they chose Access, and the faculty member responsible for setting up this database used Access. However, Dr. Aloisio and the music graduate students, who would be using the course database more frequently than anyone else, use Macintosh computers in their offices, and Microsoft does not make an Access edition for Macintosh computers.

On the other hand, FileMaker Pro could be used on both the Macintosh and the PC. This program could be purchased as a separate disk for each platform. [2] The Music Department was willing to make an extra software purchase because of FileMaker’s compatibility across platforms.

Using FileMaker gave several additional advantages, as well. First, FileMaker Pro is a scalable database system. It is designed for large amounts of data and will not bog down with only 900 records in a table. The MSU Information Technology Department has been using FileMaker in many large, University-wide database applications, for example the databases that track parking violations, student teaching assignments, and state vehicle check-out. [3] Second, the database was going to be maintained by non-technical users. FileMaker Pro is easy for the average person to understand and quick for a beginner to learn. The layout and the search features in FileMaker give the user a great deal of flexibility in viewing various parts of data, without having to learn unfamiliar terms such as “query”.

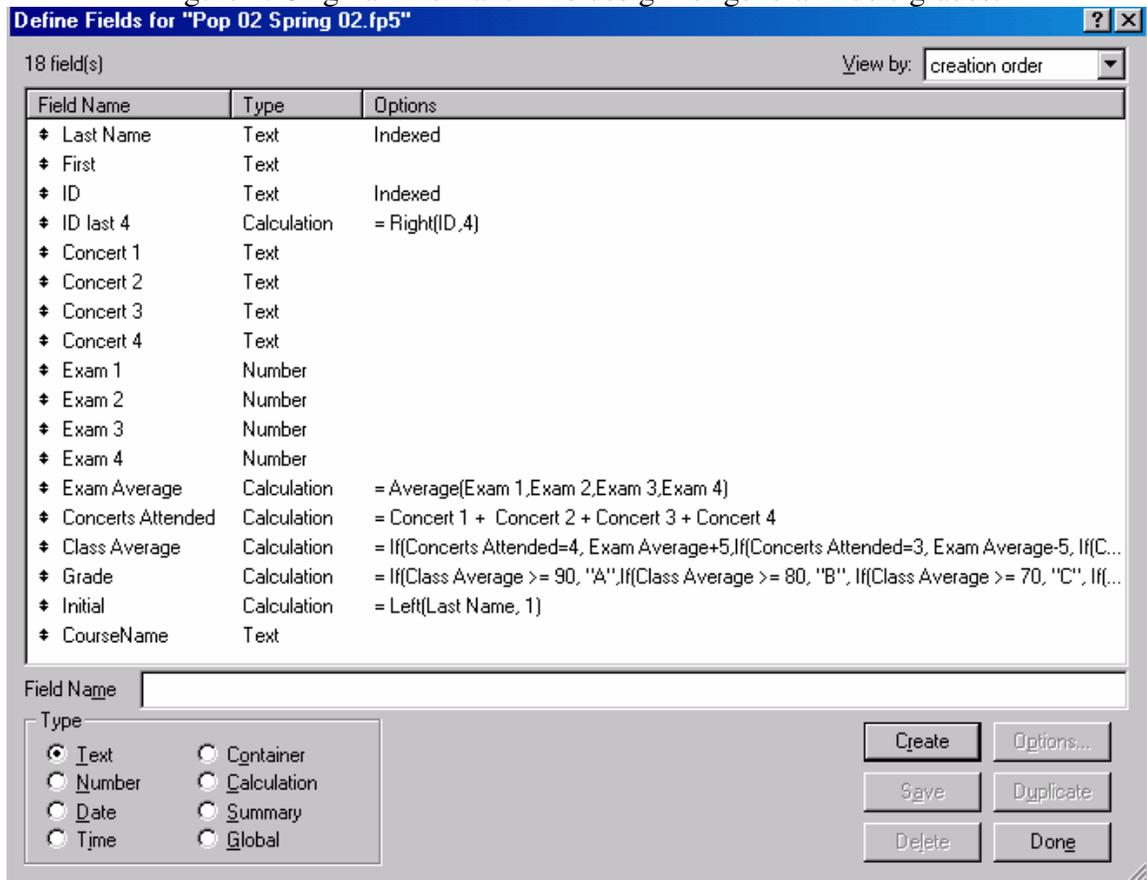
Because of this flexibility, user friendliness, and cross-platform compatibility, the Music Department chose FileMaker Pro for their database.

Features of the Original Database Design

John Lindberg of the Department of Music made the first general music database design in FileMaker Pro. He created one database for each course section. Each database had the same fields, including name, ID number, and exam scores. Four fields were created to check off concert attendance, because the total grade was based partly on the number of concerts attended. Calculated fields for grading the students included exam score average, total number of concerts attended, and class average, a weighted grade based on concert attendance plus exam score average. Two other calculated fields were created so that information could be posted by the last four digits of the student ID numbers plus the first initial of the last name field.

Figure 1 below is a screen shot of the fields used in the first database design.

Figure 1. Original FileMaker Pro design for general music grades:



The formulas for Class Average and Grade are too long to be displayed in the above “Define Fields” window (Figure 1). Figure 2 and Figure 3 show the formulas for these fields.

Figure 2. Class Average field grade calculation. Class Average weights the Exam Average fields with the Concert Attendance fields

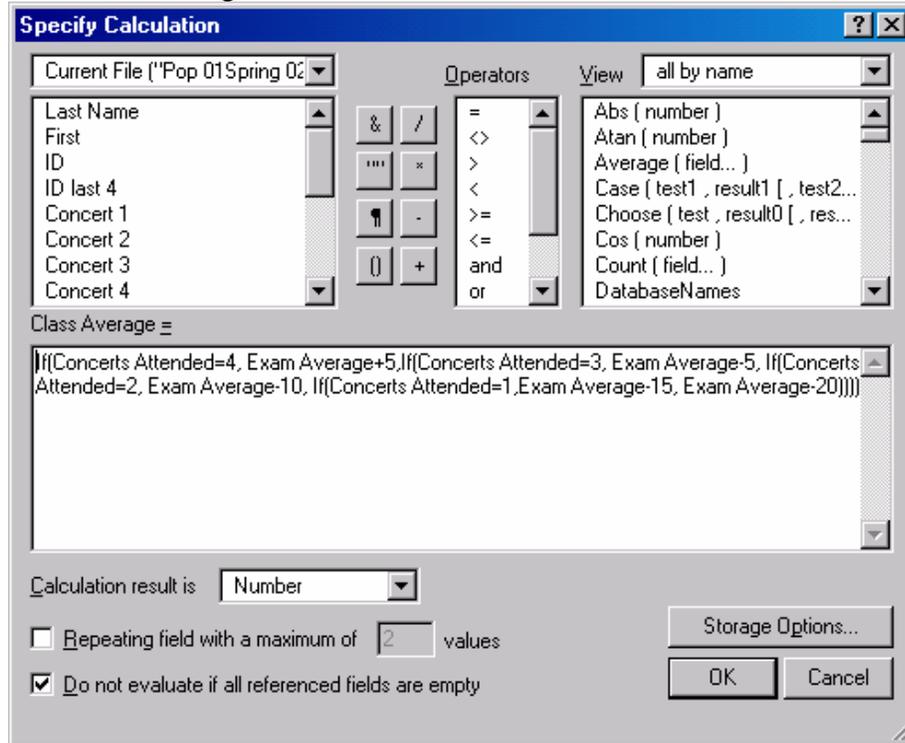
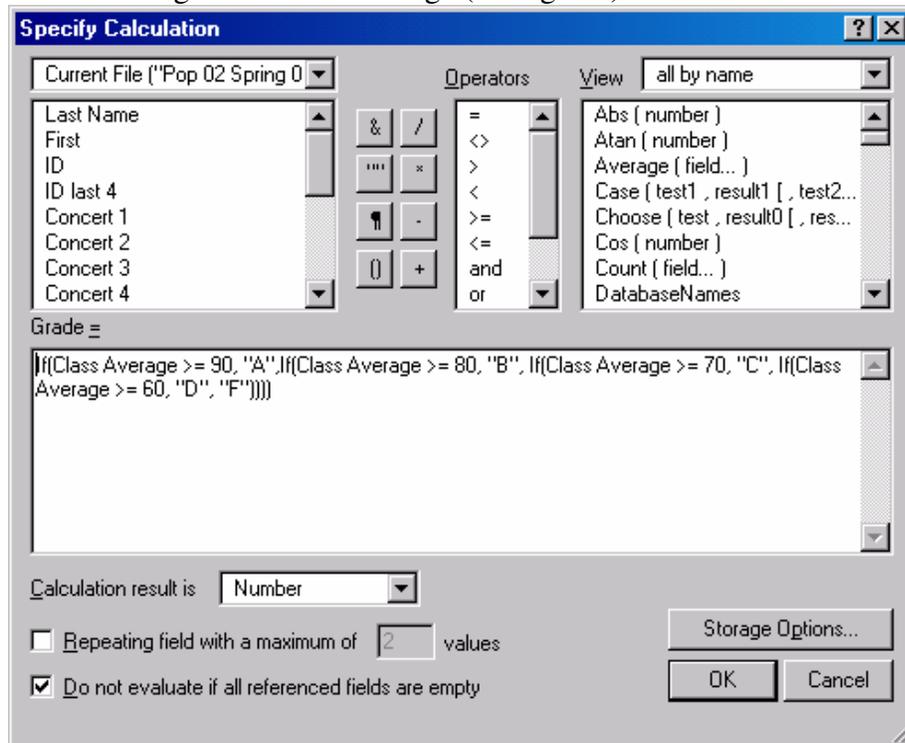


Figure 3. Class Average (final grade) calculation:



Results of the Original Database Design

As expected, storing student information and calculating grades on a database instead of by hand greatly improved record keeping for the general music courses. Much less time was spent in calculating grades, and the computer records were more accurate than the old system of hand entering records.

Another big plus in having student grade data organized into tables was being able to post the exam results and concert attendance on a Web page. An example can be seen at this URL : http://www.intech.mnsu.edu/aloisio/test_pop_day2002.htm, on Dr. Aloisio's course Web site.

Improvements Desired in the Original Database

Several improvements were still wanted in the original database design. First, the music graduate students still had to spend many hours each semester keying data into the database. The most time-consuming aspect of this data entry was in populating the database each semester with new student records. Because there were nearly 900 records, it is understandable that data entry errors occurred while reading from a class roster and transferring the names onto the computer. Entering the exam scores presented a similar problem, although this did not take as much time as entering the student information for the class roster.

In addition, the process of recording concert attendance needed improvement. When the students attended an outside concert for music class credit, they filled out a small card at the concert and turned it in to an usher. Dr. Aloisio kept all of these cards for reference. The original database design included only four fields for concert attendance, labeled Concert 1, Concert 2, Concert 3 and Concert 4, because students could earn only four attendance credits. As each batch of concert attendance cards was recorded in the database, a student would have the appropriate concert attendance choice checked off in the database.

The problem with this design was that it could not track exactly which concert a particular student attended. Students would look up their scores on Dr. Aloisio's Web site and complain that they had not received credit for particular concerts. This resulted in large amounts of time spent looking through the stacks of saved concert attendance cards for supporting evidence.

Second Attempt at Course Record Management

Improvements in Importing Class Lists at the Beginning of the Semester

To save data entry time, it was decided to learn how to import data from the Registrar into the Music Department's FileMaker database. It was found that the Information

Technology department could provide a registration data file each semester on a floppy diskette. This is in the form of a .dat file, which can be opened and saved in Microsoft Excel. FileMaker Pro will easily import an Excel file into a database with the File > Import Data command.

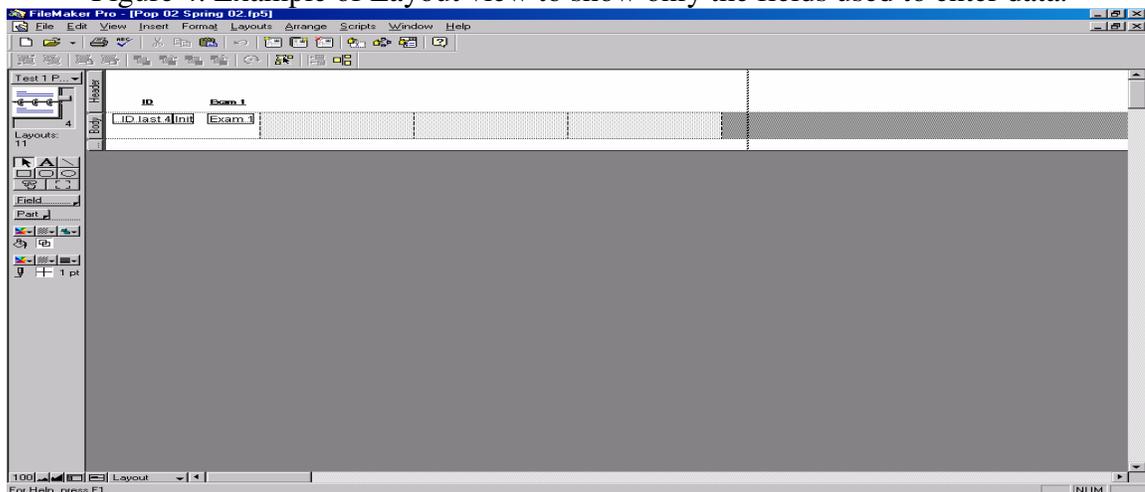
Improvements in Importing Exam Scores

Many hours of data entry were saved by importing data from the Registrar's files, and the database records were also much more accurate with this method.

The first improvement in the process of importing exam scores was the use of FileMaker's layout view to speed up data entry. The fields for exam scores were far to the right of the screen for the student name and ID number. This tended to increase time spent in data entry and also led to increased inaccuracy.

The music graduate students were taught how to create a Layout in FileMaker (a very simple process) so that they saw the view below in Figure 4 when viewing concert scores.

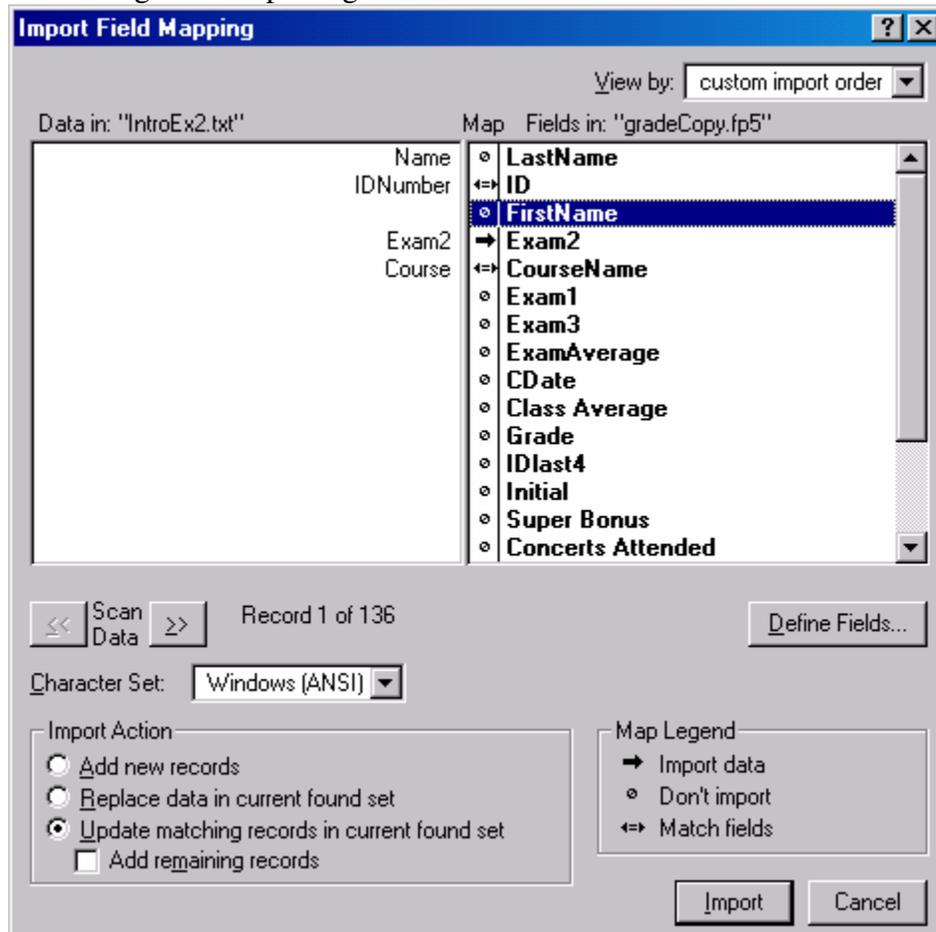
Figure 4. Example of Layout view to show only the fields used to enter data.



The layout view, although useful, was a very minor improvement in the database compared to the improvement of being able to import exam scores. The exam scores could be imported into FileMaker because exams were scored from optical character recognition sheets by the Information Technology Services Department. Like the Registrar's information, these are available as .dat files on a diskette.

FileMaker has a very powerful and flexible import feature. It can compare and match imported records on any chosen field, update empty fields in matching records and add all remaining records. See Figure 5 below for an example of a FileMaker Import Records window where ID number and Course Name of the database will be matched (mapped) to the records from the diskette, and the Exam2 scores will be added to the database. Importing data meant that the graduate students no longer had to key in individual exam scores

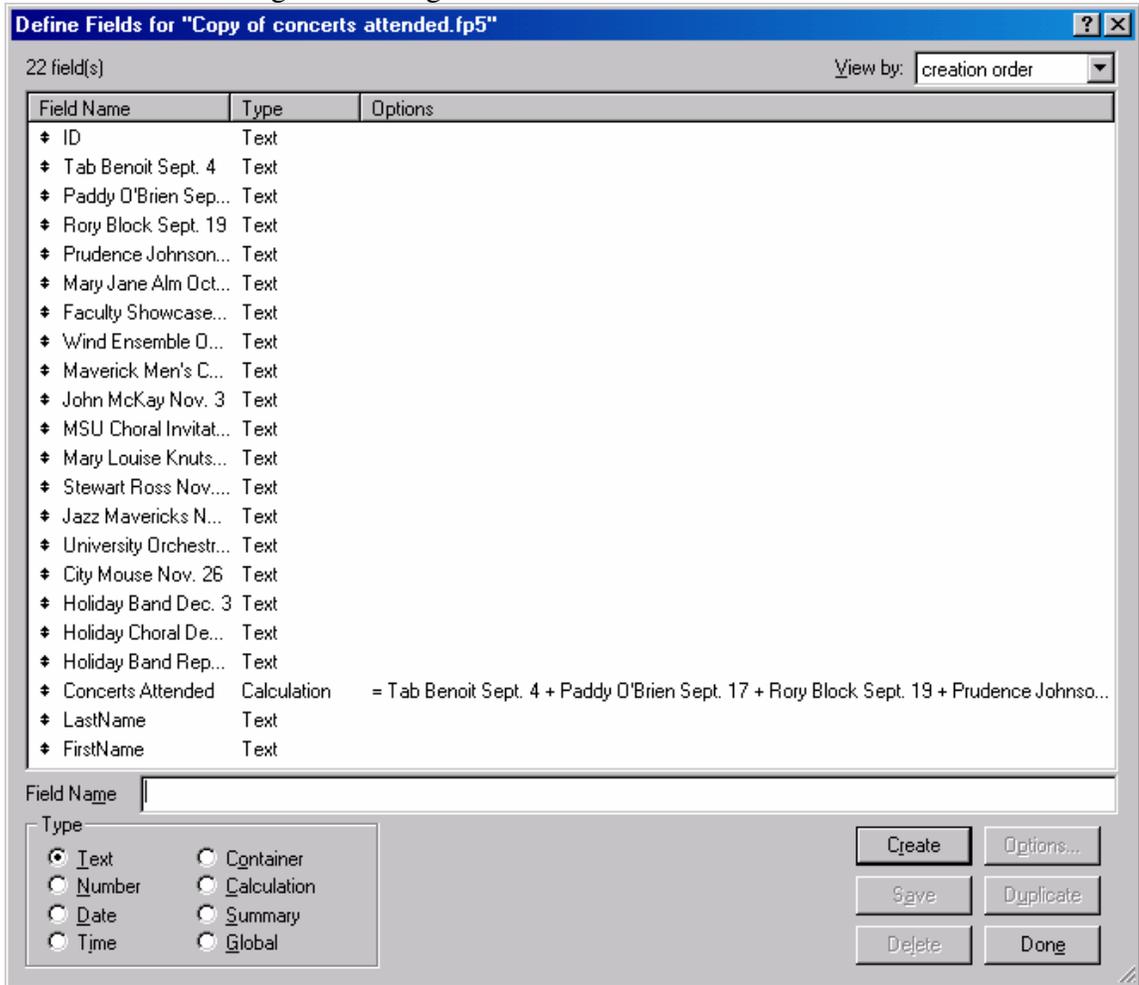
Figure 5. Importing Data into the FileMaker Pro database.



Improvements in the General Music Database Design – Portals and Servers

The original general music database was designed as a single table, and it had so many fields that the complete layout view was far wider than a single computer screen. To add fields for recording each individual concert date instead of Concert Attendance 1, 2, 3 and 4, one would change the database design. In Access, one would create a second table, for concert attendance, then form a relationship from the student data table to the concert attendance table. In FileMaker Pro, the same thing can be done, but the terminology is different. This is called creating a second database (concert attendance) and creating a portal from the first database to the second database. The result of this design change was that much less time was spent in verifying student concert attendance. The second database clearly showed exactly which concerts were attended by individuals, without crowding the student records. Figure 6 below shows the Concerts Attended database design.

Figure 6. Design of the Concerts Attended Database



The original database used three student data tables, one for each of the three large lecture sections. The problem with this design was that students sometimes didn't remember the number of the section in which they were enrolled. Any time information on their course records had to be retrieved, there was the chance that one would have to open up several different databases to locate the appropriate student record. It was decided to combine all of the general music courses into a single database (table).

This made it necessary to change the procedure for importing records slightly. Before importing records from the Registrar into FileMaker, a field was added for the course name (Pop Day, Pop Evening, or Intro). There was some initial concern that combining all sections into the same database would make the data from individual sections hard to find, but this problem was solved very easily by teaching the faculty and students to sort (query) the database by course name.

The backup of a database is always extremely important, and for this reason, the general music data was put on a FileMaker server. One advantage of having the database on a server is that tape backups are available when they are needed. Storing the database on a

server also allowed the graduate students to enter data in the music graduate office; they did not have to work directly on Dr. Aloisio's machine. [3]

Considerations in Using a Database or an Instructional Management System

An alternative to creating a database for course records is using an instructional management system (IMS). These commercial products include grading systems that an instructor can use to track scores and calculate grades.

In deciding whether to choose an IMS or a database, one of the most important questions for the non-technical user is, "Which system is easier to learn?" The commercial IMS products, for example, Blackboard.com [4], WebCT [5] and Ucompass [6], all advertise on their company Web sites that their systems are very easy to use. They strive to present an intuitive format.

From personal and anecdotal experience, some users believe that an IMS is inherently too complicated. They see all of the many IMS features and are overwhelmed. No matter how useful these features may be to other people, they can imagine a use for only a few of them. They refuse to try the IMS.

Whether a database is simpler to use than an IMS or not, is a matter of personal opinion. One could argue that not every non-technical user wants to learn to create and populate tables, and that not everyone has the skill to calculate grades by designing their own database. Database templates are included in the system, and some specialized templates may also be purchased separately as pre-packaged solutions for those who cannot or do not want to spend time designing a system. Then, there is the matter of posting information from the database to the Web. A user has to know how to make a Web page and extract database information to put on the page, but an IMS does this task automatically.

An IMS also contains many features that are not part of a database - student communication via chat room, instant messaging and email, online course content, online testing capability, and multi-media integration.. One feature that was included with the Educator IMS platform for Minnesota State University in the 2002-2003 academic year was integration with the MnSCU student record system. This enabled every course offered at MSU to be automatically populated with learners. The student user names were pulled from the MnSCU database by Ucompass, and the instructors who used Ucompass this year at MSU did not have to enter any student names or TechID numbers into their course records online.

IMS platforms also feature technical support for both faculty and student users. It is as simple as clicking on a link within the IMS site.

Database support also exists, but it is not as self-evident or user-friendly as support that is built into an IMS. Web sites for Access [7] and FileMaker Pro [1] will accept user

questions and give sources of user training. Of course, the database applications themselves include a help menu, and there are many books written on database use [8].

The most significant advantage of a database in today's economic climate might be its constancy. Purchasing a database program means that the user owns it. It will be on the user's machine every semester. The IMS systems are leased by institutions each year. A contract may expire, and the institution may decide to adopt a cheaper IMS, or maybe even no IMS, for the following academic year. Anyone who had invested the time in designing course management over an IMS would then have to make some significant changes. This isn't easy for people who don't enjoy working with computers in the first place.

Summary

For the non-technical instructor, factors such as familiarity with database concepts, availability of an instructional management system platform, support from colleagues and previous knowledge of Web page creation will influence the choice of whether to use a database or an IMS for course record keeping. Regardless of which record keeping method is chosen, the careful attention to database design and redesign will save much time in large courses.

References

1. *FileMaker*. Retrieved February 12, 2003, from <http://filemaker.com>. FileMaker Pro version 4.5 was used to create the first database for the general music courses. The current version, FileMaker Pro 6, was released in the fall of 2002, and the same FileMaker Pro 6 disk works on both Macintosh and PC platforms. A user no longer has to purchase separate versions.
2. Interview with James Lindberg of Information Technology Services, Minnesota State University, Mankato, September 8, 2002.
3. The grading database was taken off of the FileMaker server after one semester, due to concerns about too much accessibility. It is now once again used in Dr. Aloisio's office and backed up on a high-capacity diskette.
4. *Blackboard*. Retrieved February 12, 2003, <http://www.blackboard.com>.
5. *WebCT*. (2003, February 12). Retrieved from <http://www.webct.com>.
6. *UCompass*. Retrieved February 12, 2003, from <http://www.ucompass.com>
7. *Microsoft Access*. (2003, February 12). Retrieved from <http://microsoft.com/office/access/default.asp>
8. Stars, J. (2002). *Learn FileMaker Pro 5.5*. Plano, Texas: Wordware Pub. is the source used for the redesign of the music database done in Filemaker Pro 4.5.

Acknowledgements

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