

Problem Based Learning In The AIS Course

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Abstract

This paper first introduces the reader to problem based learning and builds a case for implementing it in accounting. A problem suitable for introducing this approach in the AIS course is then presented. Two possible solutions to the problem are then presented using the MS Office Desktop. The first solution involves the use of dynamic data exchange (DDE) between Word and Excel and the second solution utilizes the reporting capabilities of Access. This is a very modest attempt at introducing this instructional approach in that it is introduced as part of a course rather than a redesign of a complete course or curriculum.

1. Introduction

In addressing attendees at the annual AAA meeting in 2000 Leo Blankenship of Ernst & Young indicated that accounting recruiters want students who:

- understand and can apply information solutions to business problems
- can contribute immediately to an implementation effort
- can apply technology but speak the language of business

An instructional approach that is ideally suited to developing these abilities is Problem Based Learning (PBL). PBL is a method of instruction in which the problem drives the learning. This approach recognizes the need to develop problem solving skills as well as the necessity of helping students to acquire necessary knowledge and skills. Hopefully this manuscript will make more professors aware of this instructional approach as well as providing a vehicle to experiment with this approach.

PBL has several distinct characteristics, which may be identified and utilized, in designing a course or curriculum of study. These are:¹

1. Reliance on problems to drive the curriculum. The problems do not test skills but rather assist in the development of the skills themselves.
2. The problems are ill-structured. There is not meant to be one solution and as new information is gathered in a reiterative process, perception of the problem, and thus the solution changes.
3. Students solve the problems. Professors are coaches and facilitators.
4. Students are only given guidelines on how to approach the problem. There is no one formula for student approaches to a problem.
5. Authentic, performance based assessment is a seamless part and end of the instruction.

The distinction between problem-based learning and other forms of cooperative or active learning often are blurred because they share common features and hybrid approaches abound as instructors adapt methods for particular situations. The essential component of PBL is that content is introduced in the context of complex real world problems. Posing the problem before learning tends to motivate students.

Readers with comments or questions are encouraged to contact the authors via email.

¹ <http://score.rims.k12.ca.us/problearn.html>

They know why they are learning the new knowledge. Perhaps this gave rise to the ancient Chinese proverb

- I hear and I forget
- I see and I remember
- I do and I understand

Learning in the context of the need to solve a problem also tends to store knowledge in memory patterns that facilitate later recall for solving problems. This process is referred to as knowledge encapsulation and occurs when basic technical knowledge is remembered in the context of a particular experience. Boshuizen & Schmidt (1992) have developed a model that assists in understanding the cognitive rationale for the link between experience, knowledge, and superior professional performance. Chaharbaghi & Cox (1995) characterize a professional as having not only basic knowledge but also competencies and specific skills. The traditional and well known case approach popular in accounting and business may or may not be problem based learning. If the case is being used to integrate previously learned knowledge, as often is the case, then it would not fit the definition of problem based learning.

PBL may provide a partial solution to calls asking for changes to be made in accounting education. The most recent being by Albrecht and Sack (2000) who outline six major categories of perceived problems with accounting education: (1) course content and curriculum (2) pedagogy (3) skill development (4) use of technology (5) faculty development and reward structures (6) strategic planning and direction of accounting programs and departments. Implementation of PBL is an approach that addresses many of these perceived problems and can impact the relevance of accounting education. PBL can also be used to establish a foundation that students could use to develop a program of lifelong learning. The overriding objective of learning to learn as described in the first position statement of the Accounting Education Change Commission (1990) has yet to be achieved and perhaps PBL can play a role in achieving that goal.

While problem based learning is well known in medical education, it is almost unknown in the undergraduate curriculum. At the University of Delaware problem based learning has been introduced in a number of undergraduate courses across the curriculum and a PBL homepage has been created which contains a directory of courses using this approach. (<http://www.udel.edu/pbl/>). Very little literature exists on PBL in an accounting environment. Johnstone and Biggs (1998) describe how PBL would be most beneficial in an accounting curriculum. Breton (1999) compared problem based learning to the traditional lecture format in an accounting theory course. In that experiment the PBL students performed significantly better on 50% of the test exam questions, significantly better overall, and perceived a long-term perspective to the usefulness of their learning.

The problem about to be described has most of the characteristics of PBL in place. For those students with a more sophisticated technical background the approach might be considered more as a case rather than PBL in that they may already have the tools available to solve the problem rather than having to learn them firsthand. The approach taken here conforms with the guidelines suggested by Johnstone and Biggs (1998) for its use in accounting education in that it is a limited application of this pedagogy. Furthermore it is being pursued after basic technical accounting knowledge has been acquired. They specifically suggest that PBL is best suited for the fifth year of 150 hr accounting programs. Introducing this approach in an AIS class which is usually taken in the later years of an accounting program seems to be a reasonable approach.

2. The Problem

End-user computing grew out of software that allowed non-programming computer users to design and run their own reports. This is often done using data obtained from data files maintained on central mainframe computers. Quite often the functional business professional that is generating the report is an accountant. The advent of the PC and powerful software suites that can access these data files has increased the amount of end-user computing done by accountants who are constantly faced with the need to generate reports. This is especially true of on-demand reports, which are triggered by an event versus scheduled reports.

Assume that you are an accountant in charge of payroll at Eastfield State College. You are asked to produce an ad-hoc report that is prompted by the settlement of a collective bargaining agreement. In this case the purpose of the report is to convey information to each individual employee, regarding how their gross pay was calculated for the first pay period covered by this new agreement. This task is further complicated by the fact that in addition to determining their pay using the new pay rates, retroactive pay for the preceding 65 weeks is to be included in the gross pay amount.

2.1 Problem Details

Because of failed contract negotiations, a group of State College faculty, have worked an extended period of time without a contract. In October a temporary settlement was arrived at providing for a retroactive raise of 3%. In an effort to eliminate confusion over the amount of gross pay due each employee as a result of this settlement, it was decided to include a document along with their pay stub for the month of October. The purpose of this document was to outline how the gross pay figure was arrived at for the month of October. The format of this document along with a sample employee calculation is shown in Exhibit 1. Note that the net pay calculation is to be handled by the existing payroll program, and is not discussed here.

In addition this document should inform each employee what their weekly raise is, and what their new weekly and annual gross pay rate will be. The gross pay for the Month of October, which is a five week pay period, will consist of two components. The first component being 5 weeks pay calculated using their new weekly rate for the month of October. The second component is their retroactive pay raise for the previous 65 weeks that they worked without a contract.

Exhibit 1 Sample of Desired Output	
Human Resources Office <i>Eastfield State College</i>	
Collective Bargaining Increases October 1999 Payroll	
Name:	Jones, Dave Z
A: 06/27/98 Weekly Rate:	\$1,337.20
B: 06/27/98 3% Increase:	\$40.12
C: New Weekly Rate	\$1,377.32
D: New Annual Rate	\$71,620.64
E: Retroactive:	\$2,607.80
F: October Gross Wages	\$9,494.40

Unfortunately the computer center informed you that it would be months before they could produce this report given a shortage of staff. You are now faced with generating this ad-hoc report on your own. The one thing that the computer center indicated that it could do, was to furnish you with an Excel spreadsheet with the data fields for employee name and their old weekly rate. This information was extracted from the master employee file and loaded into columns A, B, C, and D of the Excel spreadsheet shown in Exhibit 2. For the sake of simplicity assume that only seven employees are on the payroll.

2.2 Required

As an accounting professional you are aware that payroll is a serious matter, and recognize that this document is being sent to valued employees and should be professional looking and most of all correct. In fact over 1000 employees are to be impacted by this new contract so the solution must involve computer generation of a document similar to the one described in Exhibit 1 for each employee. Your solution should involve a process that will generate a document to be included with each employee's paycheck. In this case your output should include seven pages one for each employee shown in Exhibit 2.

**Exhibit 2
Data for Employees**

	A	B	C	D	E	F	G	H	I	J
1	NameFirst	NameLast	MiddleInit	WeeklyRate						
2	Dave	Jones	Z	\$1,337.20						
3	Teresa	Paquette	R	\$1,500.00						
4	Michael	Davis	J	\$1,200.00						
5	Charles	Skender	J	\$2,000.00						
6	William	Brunelle	L	\$1,800.00						
7	Jeffrey	Cohen	N	\$2,000.00						
8	Thomas	Kida	A	\$1,400.00						
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3. Potential Solutions

Although there are numerous approaches to providing the desired output, two will be outlined here. The first approach brings together the unique capabilities of Word and Excel via a concept referred to as Dynamic Data Exchange to arrive at a solution to the problem. The second approach that will be outlined here is to use the reporting capabilities of Access. Both of these approaches are arrived at within the MSOffice environment. One could also use a traditional programming language such as Cobol, C++, or Visual Basic, although these approaches are more likely to be used by a professional programmer rather than an end user i.e. accountant.

3.1 Approach 1- Dynamic Data Exchange (DDE)

This solution will be designed in three stages. First the server application will be developed. This will be an Excel spreadsheet that will perform the desired calculations for each employee. Next the client application will be developed. This will be a Word document, containing the required information pertinent to each employee. Finally the link will be made between the two applications allowing automatic transfer between them using dynamic data exchange.

3.1.1 The Server Application

The server application is sometimes referred to as the source application because it is the source of the data that is to be provided to the client application. Excel is being used as the server because of the relative ease with

which one can perform the desired calculations. In addition we assumed that the Information Systems department made available to us data for each employee in an Excel format.

The following labels and formulas are added to the existing spreadsheet (Exhibit 2) to perform the necessary calculations:

<i>Labels</i>	<i>Formulas</i>
E1: Increase	E2: ROUND(D2*.03,2)
F1: NewWeeklyRate	F2: D2+E2
G1: NewAnnualRate	G2: F2*52
H1: Retro	H2: E2*65
I1: OctGross	I2: F2*5 + H2

The formulas in cells E2:I2 are copied to the corresponding cells for all the other employees (i.e. E3:I8). Note the use of the ROUND function when calculating the 3% increase. If this function were not used the value calculated for Dave Jones' weekly increase would still be displayed as \$40.12, if the cell was formatted to display two decimal points, however the underlying value would be \$40.116. The inconsistency between a displayed value and the underlying value that is used in calculations involving this field can lead to questions concerning the reliability of the calculations. For example calculation of the retroactive amount due $65 * \$40.116$ (using the calculated value) would result in a value of \$2607.54. If the recipient multiplied \$40.12 (displayed value) shown on the form by 65 the result would be \$2607.80. Using the Round function eliminates this type of inconsistency and eliminates calls to the payroll department questioning the accuracy of the calculations. The work required on the server application, which will supply data to the requesting application, is now complete (see Exhibit 3) and we can now shift the focus to the client application. You should note the name used when saving this file in that you must furnish it when prompted to specify the data source when creating the dynamic data exchange.

3.1.2 The Client Application

The worksheet data that has just been created will become the input to a process that fills-in a form document in MS Word that will be included with the individuals pay stub. This Word document is also referred to as the destination because it is the destination of the data found in the Excel worksheet. Launch WORD and type in the document that is to be included with the employees' pay stub. The information that needs to be typed in Word can be found in Exhibit 4. The only information that is typed in are the headings and labels. It is important to note that the information surrounded by << >> is not to be typed. The information contained within these placeholders, are the field names that correspond to the column headings in the Excel or server application. These field names will be added to the document during the Mail Merge operation, which will be used to implement the dynamic data exchange.

3.1.3 Creating the Dynamic Data Exchange

If two applications need to exchange data, as is the case here, the formal protocol used is dynamic data exchange client and server interaction. Both applications must be running in the Windows multitasking environment for the exchange to take place. When one is satisfied with the appearance of the Word document click on Tools in the menu bar and choose Mail Merge. The Mail Merge helper will appear and consists of three steps. Proceed to Step 1 "Main Document" and indicate that you would like to create a form letter and that you will be using the active document window. Proceed to Step 2 "Data Source" and get data by clicking on opening a data source and finding the Excel file that will serve the data. When the file is found click on Open, which will open Excel and initiate a dynamic data exchange (DDE) between the two applications. A message will appear indicating that your document does not contain any merged fields.

Exhibit 3 Source With Calculations

	A	B	C	D	E	F	G	H	I
1	NameFirst	NameLast	MiddleInit	WeeklyRate	Increase	NewWeeklyRate	NewAnnualRate	Retro	OctGross
2	Dave	Jones	Z	\$1,337.20	\$40.12	\$1,377.32	\$71,620.64	\$2,607.80	\$9,494.40
3	Teresa	Paquette	R	\$1,500.00	\$45.00	\$1,545.00	\$80,340.00	\$2,925.00	\$10,650.00
4	Michael	Davis	J	\$1,200.00	\$36.00	\$1,236.00	\$64,272.00	\$2,340.00	\$8,520.00
5	Charles	Skender	J	\$2,000.00	\$60.00	\$2,060.00	\$107,120.00	\$3,900.00	\$14,200.00
6	William	Brunelle	L	\$1,800.00	\$54.00	\$1,854.00	\$96,408.00	\$3,510.00	\$12,780.00
7	Jeffrey	Cohen	N	\$2,000.00	\$60.00	\$2,060.00	\$107,120.00	\$3,900.00	\$14,200.00
8	Thomas	Kida	A	\$1,400.00	\$42.00	\$1,442.00	\$74,984.00	\$2,730.00	\$9,940.00
9									
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At this point the main document is edited by positioning the cursor where one would like the first merged field to appear and then clicking on the Insert Merge Field button that is on the mail merge toolbar that now appears on the top of the screen. Select the field that is to be inserted at this position in the document. Repeat the process of positioning and inserting until all the fields that make up the document that is to be distributed to each employee has been included. When this process is complete return to the Tools menu selection in the main menu bar and choose the Mail Merge option or click on the Mail Merge helper icon on the Mail Merge toolbar.

At this point a main document and data source has already been specified and all that remains to be done is Step 3 “Merge the Data with the Document. Note the options that are in effect. When you click on the Merge button the indicated fields from the data source will be merged into the proper location on the main document. The result of this operation is the production of a file consisting of the seven documents (one for each employee) which can be printed and included with their pay stubs. This merged document can be saved in a separate file as well by clicking on Save As in the main menu selection titled File. Be aware that if there are many employees this merged file would require a considerable amount of memory. That is not the case here and one may want to save the merged file.

3.2 Approach 2- Use of The Reporting Capabilities Of Access

This approach to a solution of the problem involves the use of a blank report in Access and the use of Unbound, Bound, and Calculated controls. In short anything that is placed on a report in Access is referred to as a control. The solution will be developed in five stages. First the table providing information to the report will be constructed and then a blank report will be created. Next unbound controls will be used to place descriptive information

in the page header of the report. Finally bound and calculated controls will be used to complete the detailed section of the report providing a solution to the problem.

Exhibit 4 Client Document with Merged Fields	
Human Resources Office Eastfield State College	
Collective Bargaining Increases October 1999 Payroll	
Name:	«NameLast», «NameFirst» «MiddleInit»
Date:	Saturday, October 30, 1999
A. 06/27/98 Weekly Rate:	«WeeklyRate»
B. 06/27/98 3% Increase:	«Increase»
C. New Weekly Rate:	«NewWeeklyRate»
D. New Annual Rate:	«NewAnnualRate»
E. Retro: (B * 65)	«Retro»
F. October Gross Wages:	«OctGross»

3.2.1 Creating a Table in Access



The reports of documents that are needed to be included with each employee's paycheck requires the information provided by the Information Systems Department in the form of a spreadsheet as described in Exhibit 2. This information was extracted from an employee master file maintained by the IS department. The information that what provided must be available as a table within the Access development environment. As a practical matter the easiest way to accomplish this is to simply use the Import feature available under the File Get External Data menu choices. This feature can be used to create a table called tblEmployee that contains the record for the seven sample employees. The column headings found in the spreadsheet will become the field names. Some students may attempt to populate a table that they created by manually entering the data. Clearly this alternative would not be feasible given a large number of employees. The report that we are about to build will require that this limited amount of information be available for each employee and will serve a valuable function that will be discussed when Bound controls are placed on the report.

3.2.2 Creating a Blank Report


To create the desired custom report shown in Exhibit 1, click on the Reports Object and choose New. Use the Design view option to build the new report, and indicate that the tblEmployee will be used to provide some of the data that is to appear on the report. Some of the controls that will be placed on the report will be "bound" to the data supplied by this table. This should result in a design grid being displayed that has three sections; a Page Header and Footer section, and a Detail section. Reports often contain these three sections so Access automatically includes them in a blank report. The report will consist of one page for each employee. Each page will consist of information regarding the office providing the report and the objective of the report which will be provided in the Page header section, and information that is specific to each employee which will be placed in the Detail section of the report. The Page footer section will not be used, and it can be removed, by dragging the bottom edge of that section up until the section disappears. Once this is done you can begin to place the desired controls on the report.

3.2.3 Unbound Controls – Stand-alone Labels

As mentioned earlier one can only place controls on a report. The easiest type of control to place on a report is an Unbound control. One type of Unbound control is referred to as a stand-alone label. Stand-alone labels are used to display descriptive text such as titles, captions, or brief instructions. In this solution Unbound controls will be used to place identifying information in the Page header section of the report. This information consists of the office responsible for generating the report, and the purpose of the report. Stand-alone labels don't display values from fields or expressions, they're always unbound and they don't change as you move from record to record. These stand-alone labels, are not to be confused with labels that are attached to another control i.e. text boxes, which will be discussed in the section that follows.

A stand-alone label is created using the label button , which is found in the toolbox. The toolbox will be used to create all of the controls that are to be placed on the report. The toolbox is a specialized toolbar containing buttons that represent the tools used to place controls on a report. To view the toolbox, click the Toolbox button , on the Report Design toolbar. Because the toolbox is used extensively it should be moved or docked at a location on the report design view so that it will not interfere with the design process. Before beginning the process of placing controls on the Report design grid one should drag the bottom boundary of the Page header section down, so that there is sufficient space to accommodate the two desired stand-alone labels. See Exhibit 5 to get an approximate idea of how much room will be required as well as a preview of the two Unbound controls that we are about to place on the report.

The first stand-alone label can be created by performing the following steps:

Click on the label button , in the toolbox.

On the Report Formatting toolbar select:

- Arial for the font name
- 14 for the font size
- The Italic button and the Center text button

Move the pointer, whose shape changes to a plus sign and label, to the approximate location in the Page header section shown in Exhibit 5, and type the desired text.

To create the second stand-alone label, repeat the previous steps using bold rather than italic type, and type the desired text.

3.2.4 Bound Controls – Text Boxes


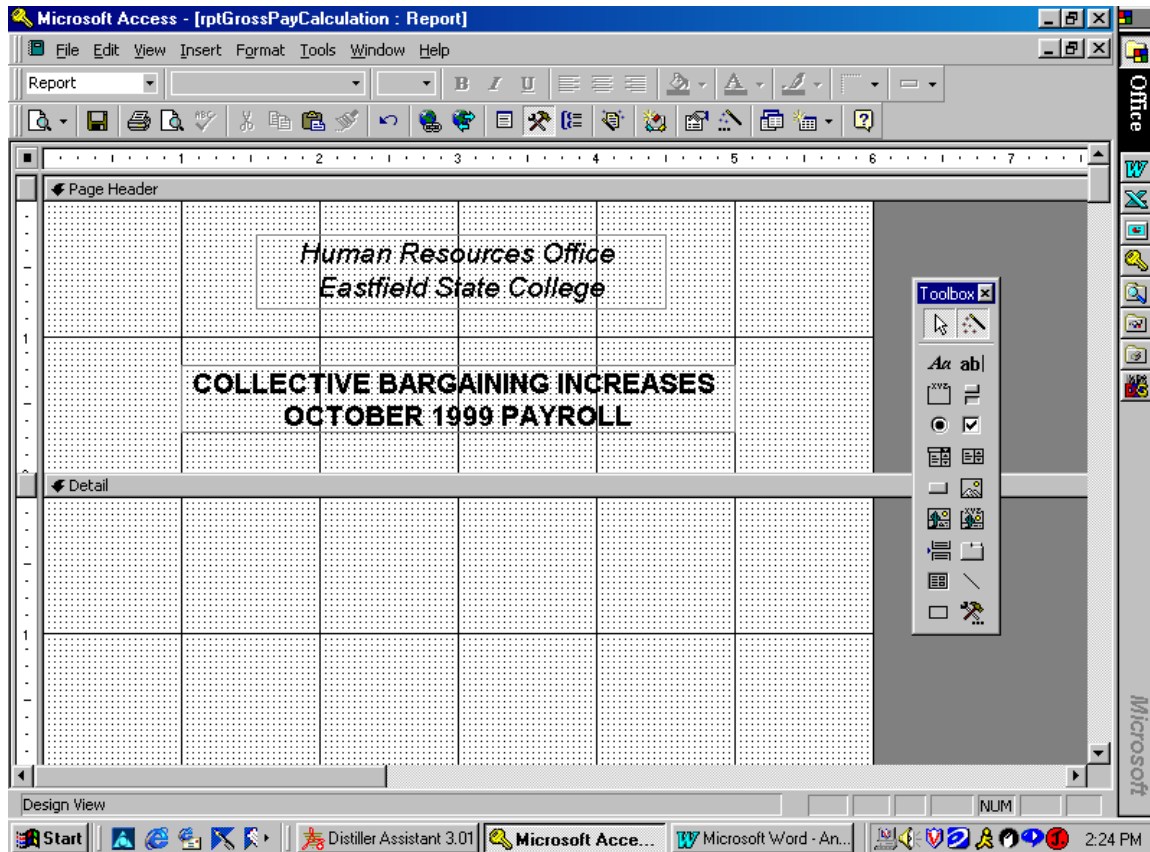
Unlike Unbound controls that do not have a data source, bound controls are tied to fields in an underlying table or query. Bound controls are used to display values from fields in the database, specifically the employees name and weekly pay rate that are found in tblEmployee. A bound control can be created using a Text Box , which appears in the toolbox, next to the Label button. The custom report being created will have two bound controls in the Detail section of the report, one for the employee's weekly rate and one for their name.

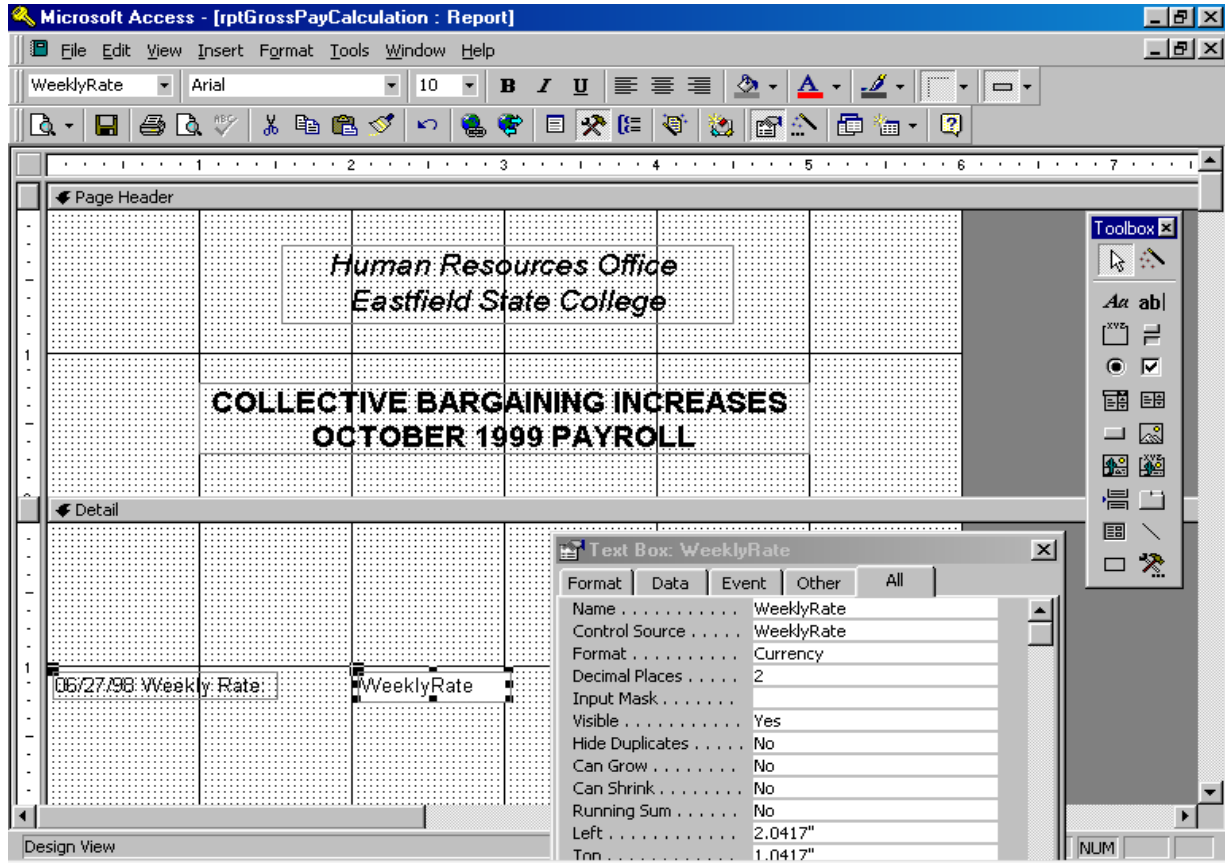
Exhibit 5 Design View of Page Header with Unbound Controls




A bound control can be created by clicking on the text button **abi**, in the toolbox. Move the pointer, whose shape changes to a plus sign and Text box symbol, to the approximate location in the Detail section where you would like the text box to appear. The first Bound control that we will place on the report is the employee's old weekly rate. If you recall this is available in the table tblEmployee. Click on the textbox if it is not active and then right click in the box and choose properties from the drop down menu that appears. Select the All tab of the property sheet if necessary to display all the properties. Next click the Control source property, click the arrow that appears in the box and click on the field WeeklyRate. You have now specified the source of data for this Bound control. Before closing the property sheet change the Name of the Text box to one that is more descriptive, WeeklyRate for example. It is important to note this name in that the name will be used when defining calculated controls in the next section. Finally change the Format property to currency, and the Decimal property to 2. Click on the attached label and change the caption to read "06/27/98 Weekly Rate". This attached label will identify the data value that appears on the report. Referring to the Design grid shown in Exhibit 6 may prove helpful at this point.

A second bound control, the employee's last name, can now be added to the report. As before click on the Text box button on the Toolbox toolbar, and place it on the Design grid. Click on the textbox if it is not active and then right click in the box and choose properties from the drop down menu that appears. Select the All tab of the property sheet if necessary to display all the properties. Next click the Control source property, click the arrow that appears in the box and click on the field NameLast. You have now specified the source of data for this Bound control. Type Name: in the attached Label. Repeat this process for the fields NameFirst, and MiddleInit. However for both of these bound controls simply delete the attached labels. Switch to the Print Preview view to see if the report is as desired.

Exhibit 6 Design View of Detail Section with Bound Control



An alternative approach to defining a Bound control is to click on the Field list button , on the Report design toolbar, and drag the desired field onto the design grid. An attached label will appear as does when a Text box is placed on the Design grid. Positioning, setting font sizes, and defining control properties also needs to occur as before.

3.2.5 Calculated Controls –Text Box

A calculated control is a special type of a bound control. A calculated control uses an expression as its source of data rather than data from a field name in a table as we did in the previous section. A text box is the most common type of control to use to display a calculated value, but you can use any control that has a ControlSource property. The expression can be placed directly in the textbox or can be typed in the Control Source property of the Textbox. The expression can use data from a field in an underlying table or query, or data from another control on the report. The following five calculated controls must be created:

- Weekly 3% Increase
- New Weekly Rate
- New Annual Rate
- Retroactive Pay
- October Gross Wages

To create the calculated control for the employee’s 3% increase do the following:

Click the TextBox tool in the toolbox.
On the report, click where you want to place the control.

Do one of the following:


- Type the expression directly in the control.
- Type the expression in the ControlSource property box of the control.

Type the following expression in either of the above: =[WeeklyRate] * .03

This calculation reflects a weekly increase in pay of 3%. Note that when defining a calculated control, each expression is preceded with the = operator. Enter an appropriate descriptive title in the attached label, adjust the positioning, set font sizes, and define other properties of the control as before. Be sure to define the Name property so that this control can be used in expressions that you will have to create for the other controls. Name this control Increase. Naming a calculated control has the effect of having it appear on the left-hand side of the equal sign. In order to align the values calculated you will also have to set the TextAlign property to Right for each of the calculated controls.

Repeat this process for the four remaining controls. The expressions that will define or bind values to these controls are as follows:

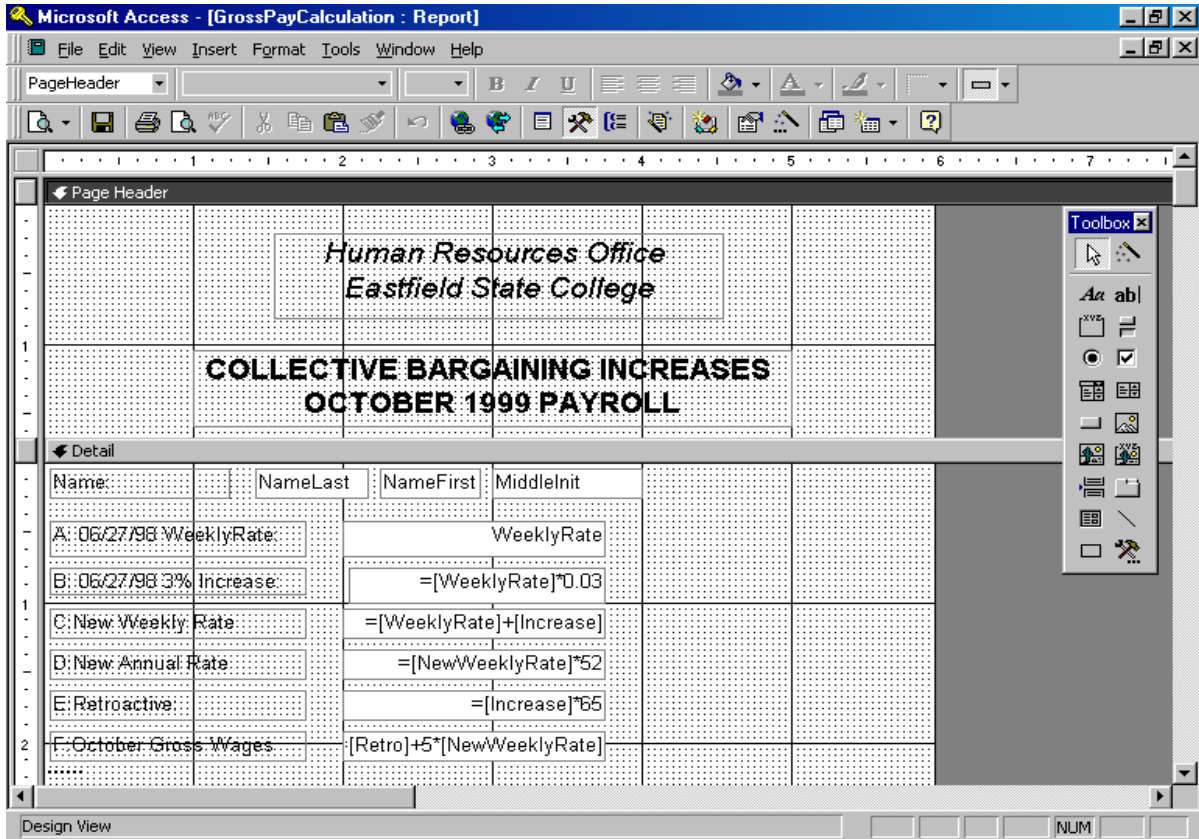
<u>Attached Label</u>	<u>Expression in Calculated Control</u>	<u>Name of Control</u>
New Weekly Rate	=[WeeklyRate] + [Increase]	NewWeeklyRate
New Annual Rate	=[WeeklyRate] * 52	NewAnnualRate
Retroactive Pay	=[Increase] * 65	Retro
October Gross Wages	=[Retro] + 5 * [NewWeeklyRate]	OctoberGross

At this point the form is complete and has two Unbound, two Bound, and five Calculated controls. An alternative approach to define calculated fields would be to perform the calculations using a query and then use bound controls as done in the previous section. You may have noticed when in you were in the Page Preview view that more than one employee was appearing per page. This is not the intent. It is desired to have one page to include with the respective pay stub. To accomplish this we will use a control available on the Toolbox toolbar. The Page Break control  is used in reporting to mark where you want to start a new page within a section. For example, we would like the page break to appear immediately after the last calculated control. To add the page break:

- Open the report in Design view.
- Click the Page Break tool in the toolbox.
- Click the report where you want to place the page break.

Microsoft Access marks the page break with a short dotted line on the left edge of the report. Exhibit 7 summarizes the work done in this section.

Exhibit 7 Design View of Completed Report



4. Summary

The purpose of problem based learning is to provide a learning environment in which a problem drives the learning. That is before students learn some knowledge they are given a problem. The problem is posed so that the students discover that they need to learn some new knowledge before they can solve the problem. Concisely PBL is a method of instruction that helps students hone their professional development skills so as to become successful in their post-college careers. Additionally PBL provides a vehicle for the student to develop the ability of “learning to learn”, an objective set forth by the AECC, so that they can achieve the highest potential in their profession. This is especially important in that the accountant is responsible for continuing to stay current on the technology that is impacting the profession.

The problem presented here was framed in a payroll context, however the task selected is such that it should be of interest to an individual working in any accounting context. The problem has many possible solutions. Two possible solutions to the problem are included. Both of these solutions are representative of the powerful productivity tools that are available in the Office environment. Becoming familiar with these tools will certainly help students develop as an accounting professional. These solutions are presented in that the accounting professional will, in all likelihood have Office on his or her desktop. Although this has been a very brief exposure to these topics, hopefully it has been sufficient, and will encourage students to effectively continue the learning process.

5. Suggestions for Future Research and Teaching

The problem based learning approach to professional education has been growing in importance over the years. The prime area where it has been working successfully is in medical education. This paper considers the po-

tential of a very limited implementation of this approach in an AIS course. The use of this approach in an AIS course seems quite natural in that it is reasonable to require students to develop accounting and reporting solutions to real world issues in that course. It is also an area where one can incorporate academic service learning, which integrates community service with course requirements. Future research should include an instrument to assess the efficacy of the solutions that are arrived at for the problem. As one expands the implementation to the course or curriculum level, future research should provide evidence regarding the efficacy of this type of learning. The focus of these studies should consider whether a more intensive implementation of PBL yields improved knowledge structuring, reasoning abilities, self-directed learning skills, and motivation for learning. It also should be determined if students perceive this approach to be useful in the learning process.

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