Teaching Visual Basic.Net: A Student Oriented Success Method

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ABSTRACT

This paper presents an approach that is different from the common approach currently used in most texts that cover Visual Basic.Net. The approach that we use was developed to counter two major concerns:

1. *that students really haven't learned how to program and have no idea what goes on behind the objects that are placed on a form and*
2. *that the Visual Basic.Net language has evolved away from a language that is useful for teaching beginning programmers.*

INTRODUCTION

BASIC is an acronym that stands for Beginners All-purpose Symbolic Instruction Code. The contention of the authors of this paper is that without a radical modification of the general approach used to teach beginning programmers the VB.Net language, there are considerable problems in the learning process for new students who have never programmed.

The primary problem that we have found in teaching this language is that students can learn to design a great looking form; place all sorts of controls on the form; make it look very nice,

follow the code examples in the textbook, and still have no idea how the code achieves the desired output in the program. In the following exposition we suggest a very different approach to teaching the VB.Net language.

DESIGN FIRST

The first step in our methodology is that the student is given a problem such as:
Prompt an operator for and receive two integers. Add the two integers together. Subtract the second integer from the first integer. Multiply the first integer by the second integer. If the second integer is not zero divide the first integer by the second integer. Display the two integers, their sum, difference, product and quotient.

We will use the seven step process suggested by Professor Lesley Ann Robertson in her book, *Simple Program Design* (Robertson, 2004). The first step is to understand the problem in terms of outputs, inputs and processes. Please note that here and throughout this paper we use output, input, and process. We have found that if we focus on output first, instead of input, the program tends to become more user oriented.

Professor Robertson suggests that after carefully reading the problem, highlight the nouns and appropriate adjectives and the verbs. This is shown in the following paragraph where we have underlined the verbs and highlighted the appropriate nouns and adjectives.
Prompt an operator for and receive two integers. Add the two integers together. Subtract the second integer from the first integer. Multiply the first integer by the second integer. If the second integer is not zero divide the first integer by the second integer. Display the two integers, their sum, difference, product and quotient.

The next step is to develop a defining algorithm. We differ a little from Professor Robertson at this point; she uses a table to create the algorithm; we use pseudocode in Microsoft's Notepad. The results are essentially the same. We carefully point out to students that the verbs describe whether the nouns involved are output, input, or processes. For example, receive can be only for input, display only for output and add only for processing. If the verb is, for example, an input operation the verb will point to the noun(s) that are input. In the above example the verb *receive* is pointing to *two integers*; the verb *display* is pointing to *two integers, sum, difference, product,* and *quotient.*

The defining algorithm for the problem is listed below:

Lab 3-1 defining algorithm

outputs
    integer_1
    integer_2
    sum
    difference
    product
    quotient

```
inputs
        integer_1
        integer_2
work area
        string_in
        toggle_switch[rl]
processes
        prompt for input
        receive integer_1 integer_2
        test value of integer_2
        calculate sum, difference, product, quotient
        display integer_1 integer_2 sum difference product quotient

end
```

The next step is to develop the solution algorithm, a test data set, expected results, and a desk check of the algorithm using the test data set. The solution algorithm that we developed is listed below.

Lab 3-1 solution algorithm

```
calculate program
toggle_switch = 0
prompt for integer_1
receive integer_1
prompt for integer_2
receive integer_2
sum = integer_1 + integer_2
difference = integer_1 – integer_2
product = integer_1 * integer_2
if integer_2 = 0 then
        display “division by zero error”
        toggle_switch = 1
else
        quotient = integer_1 / integer_2
endif

if toggle_switch = 0 then
        display integer_1 integer_2 sum difference product quotient
else
        display integer_1 integer_2 sum difference product
end if
toggle_switch = 0
end
```

Test data set

	Integer_1	Integer_2
Set 1	4	2
Set 2	8	0

Expected results

	Sum	Difference	Product	Quotient
Set 1	6	2	8	2
Set 2	8	8	0	Divide error

The next step is to desk check. We only show the desk check for one test data set in this paper. Also, Professor Robertson uses a table to desk check. We just write or type the results into a copy of the solution algorithm.

In the student's work all test data sets should be executed against the algorithm.

Lab 3-1 solution algorithm

```
calculate program
        toggle_switch = 0       (assignment of value)
        prompt for integer_1    (Enter Integer 1)
        receive integer_1       (Integer_1 = 4)

        prompt for integer_2    (Enter Integer 2)
        receive integer_2       (Integer_2 = 2)

        sum = integer_1 + integer_2  (sum = 6; 6 = 4 + 2)
        difference = integer_1 – integer_2 (difference = 2; 2 = 4-2)
        product = integer_1 * integer_2 (product = 8; 8 = 2 * 4)

        if integer_2 = 0 then       (not executed)
                display "division by zero error"
                toggle_switch = 1
        else
                quotient = integer_1 / integer_2  (quotient = 2; 2 = 4 / 2)
        endif

        if toggle_switch = 1 then
                display integer_1 integer_2 sum difference product (all results are
                displayed except quotient)
        else
                display integer_1 integer_2 sum difference product quotient (all results
                are displayed)
        end if
```

toggle_switch = 0 (assignment of value)

end

CODE LAST

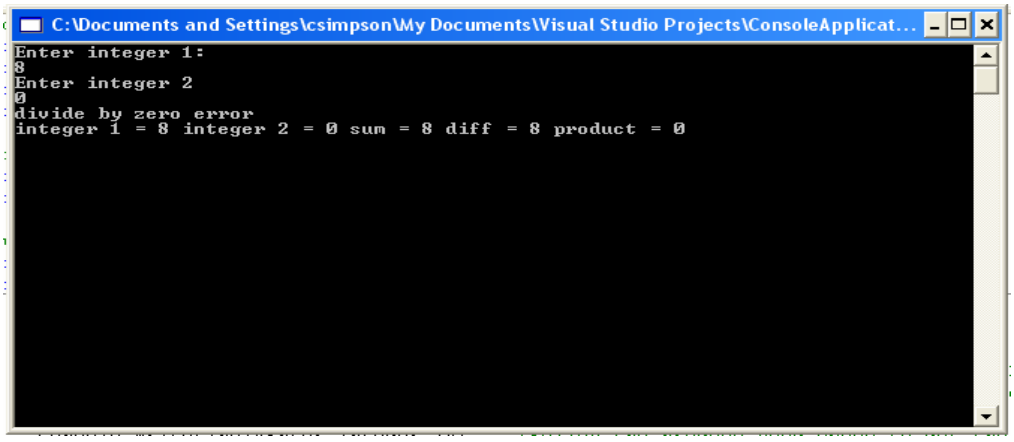
The next step in the process is to code the program in the language of choice. We begin with VB.Net *console applications* instead of Windows Application because this is where we prepare students for what is really going on behind the scenes in the windows applications.

The defining algorithm is used to define the data that are used in the program and the solution algorithm is used for the program logic that is written in the program module. The logic from the console application is listed below:

```
Module Module1

    'John Q. Student
    'lab 3-1

    'outputs
    Dim sum As Integer
    Dim difference As Integer
    Dim product As Integer
    Dim quotient As Integer

    'inputs
    Dim integer_1 As Integer
    Dim integer_2 As Integer

    'work area
    Dim string_in As String
    Dim toggle_switch As Integer = 0


  sub main()
        Console.WriteLine("Enter integer 1:")   'prompt for integer 1
        string_in = Console.ReadLine()          'get the first integer; it    comes in the program as a
string
        integer_1 = Convert.ToInt16(string_in)  'convert string_in to integer data and store it in
integer_1

        Console.WriteLine("Enter integer 2")    'Follow the process used above to get the second
integer
        string_in = Console.ReadLine()
        integer_2 = Convert.ToInt16(string_in)

        sum = integer_1 + integer_2             'sum the two integers
```

```
        difference = integer_1 - integer_2      'compute difference
        product = integer_1 * integer_2         'compute product

        If integer_2 = 0 Then                   'avoid divide by zero
           Console.WriteLine("divide by zero error")  'error message; we could have used msgbox command here
           toggle_switch = 1                    ' set the toggle_switch to not print output
        Else
           quotient = integer_1 / integer_2     'compute quotient
        End If

     If toggle_switch = 0 Then
        Console.WriteLine("integer 1 = {0} integer 2 = {1} sum = {2} diff = {3} product = {4} quot = {5} ", _
           integer_1, integer_2, sum, difference, product, quotient)
     Else
        Console.WriteLine("integer 1 = {0} integer 2 = {1} sum = {2} diff = {3} product = {4} ", _
                  integer_1, integer_2, sum, difference, product)
     End If
                        toggle_switch = 1               ' set the toggle_switch to not print output

     Console.ReadLine()                 'this command stops the screen

     End Sub

  End Module
```

One of the test sets captured with the Print/Scrn key and then pasted into this document is shown below:



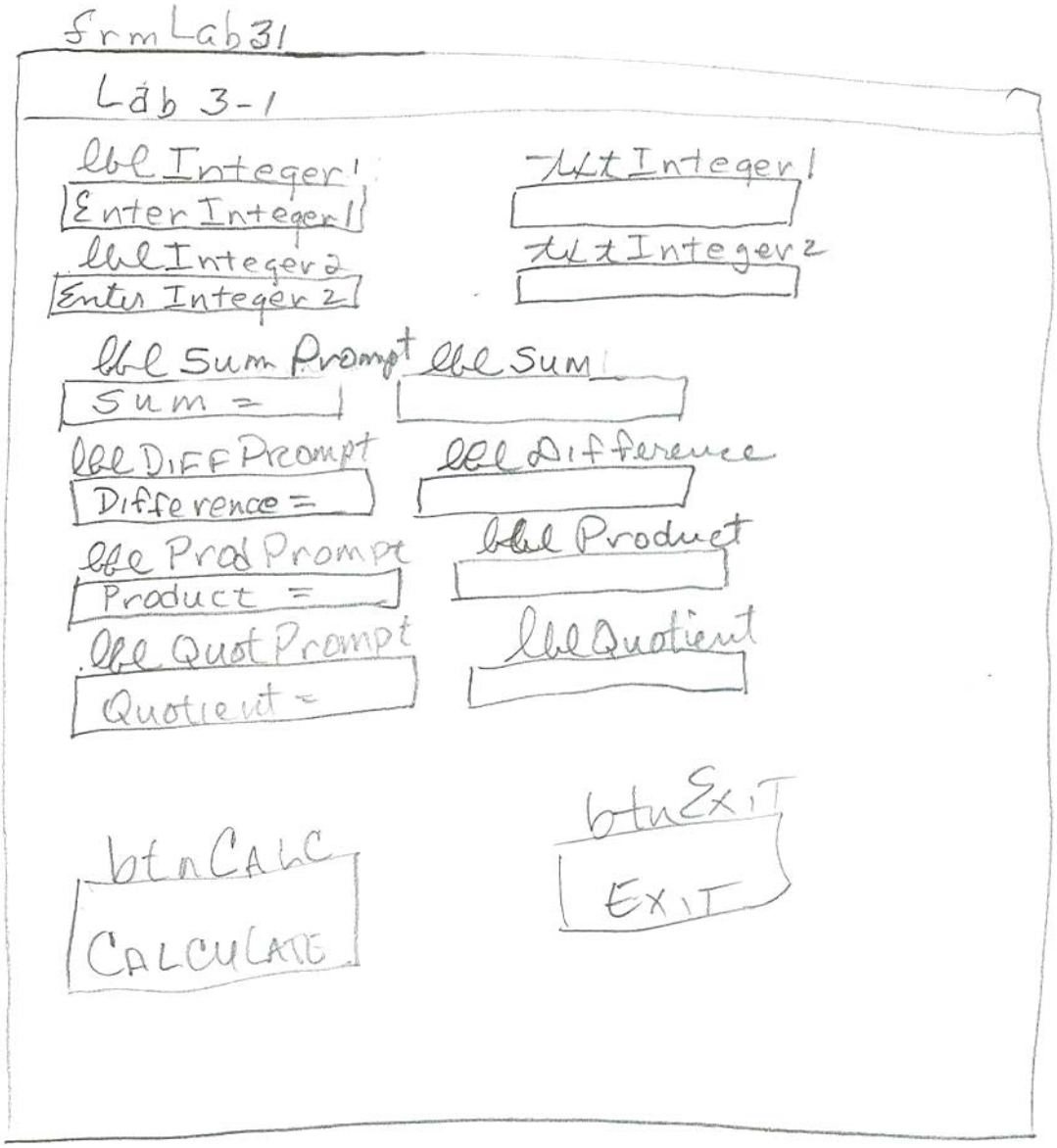
The test results are compared to the expected results and in all cases the expected results and the program results are identical. The test set should include all possibilities for the logic. The test sets that we used did not include divide by zero and should have been included.

The rest of the paper will address how the same problem is solved in a Windows Visual Studio.Net (VB) application.

THE WINDOWS SOLUTION

The steps used in the development of the Windows solution are the same as the steps used above except that we insert a drawing of the user-interface so that we can determine, to a degree, what the form is going to look like and the names that the objects on the form will take on.

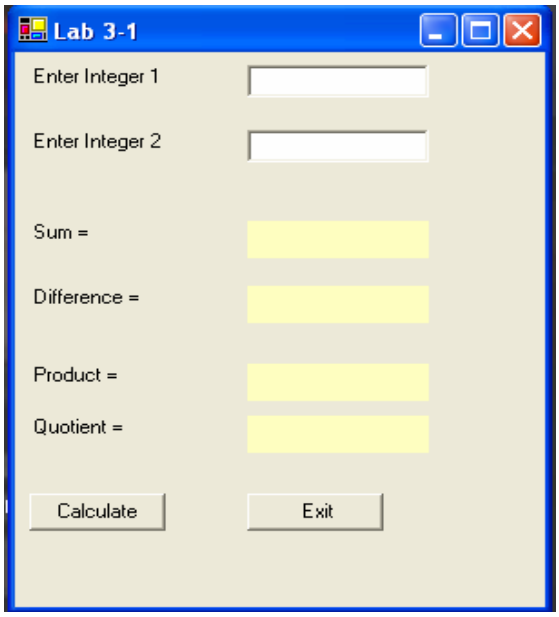
A Penciled Diagram of the Graphical User Interface (GUI)



Some faculty prefer Task Object Event (TOE) charts. This is fine; use whatever serves your students best. We prefer a graphical diagram as indicated above with the objects labeled and some idea of how the form should look. True, this does not look all that great but it does give the student and idea of what s/he wants the form to look like.

Drawing the GUI Form in VB.Net

Once the diagram is drawn; all the student has to do is use the toolbox to place the objects on the form and name each object's properties. We have captured the form with the objects we placed on it and have pasted it into this document.



As can be seen here the form is somewhat close to the penciled GUI interface. If we were to print the object name list you could see that the object's properties have been named in accordance with the penciled diagram.

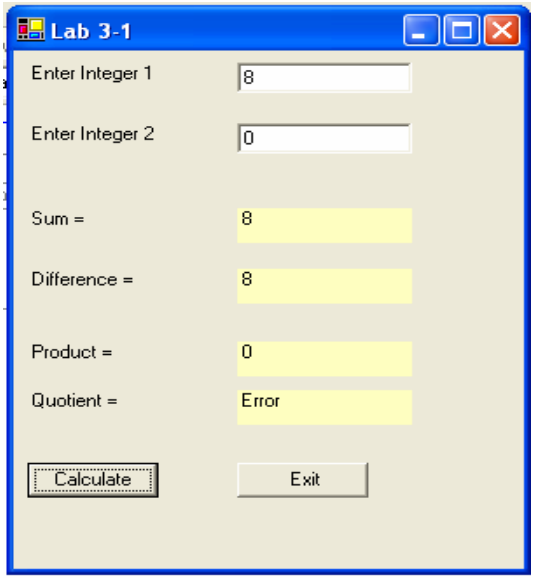
The VB.Net Code

The Visual BASIC code for this problem is listed below.

```
Private Sub btnExit_Click(ByVal sender As System.Object, ByVal e As System.EventArgs)
Handles btnExit.Click
        Me.Close()
    End Sub
    Private Sub btnCalc_Click(ByVal sender As System.Object, ByVal e As System.EventArgs)
Handles btnCalc.Click
        'please do not worry, at this point, about global or local variables.
        'outputs
        'please note that the outputs are defined on the form as labels.
```

```
        'inputs
        Dim integer_1 As Integer
        Dim integer_2 As Integer


        integer_1 = txtInteger1.Text        'this command gets the text value out of the text box
        integer_2 = txtInteger2.Text        'This command gets the integer 2 value

        lblSum.Text = integer_1 + integer_2      'add the integers and move them to the appropriate
label
        lblDifference.Text = integer_1 - integer_2   'subtract integer 1 from integer2 and put in label
        lblProduct.Text = integer_1 * integer_2    'multiply the values and put in appropriate label

        'before you can divide you must check for divide by zero which is not possible.
        If integer_2 = 0 Then
            lblQuotient.Text = "Error"  'error for divide by zero
        Else
            lblQuotient.Text = integer_1 / integer_2
        End If


    End Sub

Private Sub txtInteger1_GotFocus(ByVal sender As Object, ByVal e As System.EventArgs)
Handles txtInteger1.GotFocus
        lblSum.Text = ""
        lblDifference.Text = ""
        lblProduct.Text = ""
        lblQuotient.Text = ""
    End Sub
End Class
```

This is a very rough program and it is written to parallel the monitor program above. There are more things that should have and would have been done to make this a complete program. The objective here is to show students how to create a form and put the appropriate code with, in this program, the command buttons. If you run this program you will see that the outputs received here are the same as those obtained in the Console Application program.



SUMMARY AND CONCLUSIONS

We believe that this approach gives the student a better idea of what she or he is doing than getting hung up in most textbook's chapter 3 which usually is covering all the objects available in VB.Net and getting them on the form.

REFERENCES

Robertson, L. (2004). Simple Program Design: a Step by Step Approach. (Boston: Thomson)

This comprehensive introduction to Visual Basic.NET covers GUI design, controls, methods, functions, data types, control structures, procedures, arrays, object-oriented programming, strings and characters, sequential files, and more. It also includes higher-end topics such as database programming, multimedia and graphics, and Web application development.Â Teaches students Visual BasicÂ®.NET from the ground upâ€”using Visual Studio.NET 2003. This updated edition features updated screen captures and line numbers so that it is compatible with VS.NET 2003. Application-Drivenâ„¢ methodology. Student assessment has changed in the new millennium. Though thereâ€™s something to be said for old-fashioned paper and pencil methods, new technologies are evolving daily to assist teachers with this task. Students today are bombarded with technology, virtually from the day they are born. Not only are they familiar with the technology, they expect to use it in all aspects of their lives, including at school. The draw of technology is the lure of instant gratification. It is for this reason that old-school ways of assessment, when they are still used, must be engaging for the students, informati 2. Visual Basic language is not intended for primary step of learning but for the solution of other tasks, particularly, for office programming. Pascal.Â Programming language of Pascal ABC.NET environment includes not only classic Pascal language but also the majority of possibilities offered by Object Pascal and all modern programming language features such as classes, interfaces, lambda expressions, garbage collection and many others. These features allow to separate the study into necessary stages mentioned in the article given, i.e. to receive basic knowledge in the sphere of programming first, and deepen the knowledge received with the skills in object-oriented programming later.