

The Relative Efficacy of Video and Text Tutorials in Online Computing Education

Guido Lang
guido.lang@quinnipiac.edu
Quinnipiac University
Hamden, CT 06518

Abstract

This study tests the effects of tutorial format (i.e. video vs. text) on student attitudes and performance in online computing education. A one-factor within-subjects experiment was conducted in an undergraduate Computer Information Systems course. Subjects were randomly assigned to complete two Excel exercises online: one with a video tutorial and one with a text tutorial. The instructions in the video tutorial and the text tutorial for the same exercise were identical – differing only in their presentation format. Following each tutorial, subjects completed a short test and a survey. Results suggest that tutorial format does not cause significant differences in student performance, time spent on tutorial, time spent on test, perceived time spent, perceived difficulty, perceived helpfulness, enjoyment, motivation, or likelihood to recommend the tutorial. Given this finding, educators and instructional designers are best advised to minimize the effort and cost involved in creating and implementing tutorials.

Keywords: tutorial format, video tutorial, text tutorial, student attitudes, student performance

1. INTRODUCTION

The widespread adoption of video tutorials and video-based learning in online learning systems and massive open online courses (MOOCs), such as Khan Academy, edX, and Coursera, has led to a plethora of new developments in the field (Giannakos, 2013). As a result, many different forms of video are used in online learning today: traditional lecture-style videos, slides with voice-over, tablet captures, screencasts, interviews, etc. Among the many praised benefits of videos for online learning is the ability to build rapport and motivate learners (Hansch et al., 2015). At the same time, the creation and implementation of videos requires significant effort and cost.

However, the efficacy of video tutorials has not been clearly established in the literature. In fact, a recent review of video in online learning concluded: "Yet, considering that video is the main method of content delivery in MOOCs, it is disconcerting how little research has been done to actually measure its pedagogical

effectiveness" (Hansch et al., 2015, p. 13). The present work aims to address this shortcoming and provide insights into the relative efficacy of video tutorials. In particular, it aims to address the following research question: What are the effects of tutorial format (i.e. video or text) on student attitudes and performance?

This paper proceeds as follows. The next section provides an overview of previous work investigating the efficacy of video tutorials in the context of online computing education. Afterwards the methodology is introduced. This is followed by the results, a discussion, and finally a conclusion.

2. LITERATURE REVIEW

The topic of video tutorials and video-based learning is gaining significant attention in the research community, as indicated by the growing number of publications in this field (Yousef, Chatti, & Schroeder, 2014; Giannakos, 2013). However, only a handful of studies have

conducted experimental investigations into the efficacy of video tutorials in the context of online computing education. In contrast to other academic subjects, computing education tends to combine conceptual understanding with technical skills. Thus, tutorials are of particular importance in computing education. Among the few efficacy studies in this field are Lee, Pradhan, and Dalgarno (2008), Breimer, Cotler, and Yoder (2012), Lloyd and Robertson (2012), and Tekinarslan (2013).

Lee, Pradhan, and Dalgarno (2008) evaluated the impact of video tutorials in an introductory programming course. Video tutorials were used as part of a scaffolding exercise to introduce students to object-oriented programming using BlueJ, a Java development environment. Subjects were randomly assigned to have access to video tutorials about BlueJ or not to have access to any tutorials. The video tutorials showed how BlueJ was used but did not have any narration. Subsequently, subjects completed a paper-based test, requiring them to write Java code to perform a number of tasks. Findings suggest that video tutorials did not have an impact on student performance. However, because the tutorials were not directly related to the test material and did not include any explanations, it is possible that the negative result was due to limitations in the design of the study and the tutorials.

Breimer, Cotler, and Yoder (2012) examined differences between video and text tutorials with respect to concept learning, task completion time, retention, and student impression as part of a database exercise using Microsoft Access. Subjects were randomly assigned to either receive video or text tutorials and subsequently completed a test and survey. The video tutorials lasted about 35 minutes and the corresponding text tutorial consisted of 1600 words and 20 screenshots. Interestingly, the authors did not find any statistically significant differences between the two groups with regards to the dependent variables. However, the authors found that differences in tutorial format caused differences in student learning behavior. Specifically, the average completion time of subjects in the video condition was nearly twice the duration of subjects in the text condition. Thus, it is possible that the negative findings were due to information or usage differences between video and text tutorials.

Lloyd and Robertson (2012) assessed the effect of video tutorials vs. text tutorials on learning

outcomes in the context of teaching statistics using SPSS. Subjects were randomly assigned to receive a video tutorial (lasting about 12 minutes) or a text tutorial demonstrating how to conduct an independent samples *t*-test analysis in SPSS. Subsequently subjects were tasked to solve a statistics problem by applying the knowledge gained in the tutorial. Findings show that subjects in the video tutorial condition performed significantly better than subjects in the text tutorial condition.

Tekinarslan (2013) conducted an experiment investigating the effect of video tutorials on student learning when teaching Microsoft Excel. Subjects were taught Excel during computer lab sessions and were randomly assigned to either have access to screen recordings of the lab sessions or not to have access to the recordings. At the end of the semester, subjects' knowledge of Excel was assessed using a test. Results suggest that subjects with access to the video tutorials performed significantly better than subjects without access to tutorials. Thus, the author concludes that providing video tutorials is better for student performance than providing no tutorials at all.

In summary, previous research provides some tentative support for the advantage of video tutorials over text tutorials. However, previous work focused solely on student performance – without considering student attitudes. This leaves entirely open the question if and to what extent students' attitudes are differently affected by video and text tutorials. It is possible that while increasing student performance, video tutorials negatively affect student attitudes.

3. METHODOLOGY

The purpose of this study is to test if and how tutorial format (i.e. video vs. text) affects student attitudes and performance. An experiment was conducted as part of an undergraduate introductory Computer Information Systems course at mid-sized, private university in the northeastern United States. Students participated in the experiment in exchange for extra credit (worth approximately 5% of the final grade).

The experiment, which took place entirely online, asked subjects to complete two Excel exercises: one exercise on using LEFT and SEARCH functions to extract and copy text strings into separate cells (exercise 1) and one exercise on using INDEX and MATCH functions to

lookup values in a table (exercise 2). Each exercise consisted of a short tutorial – in video or text format – followed by a test and a survey. The video and text tutorials for each exercise were carefully designed to be equivalent in their information content. In other words, the instructions contained in the video tutorial for an exercise were identical to the instructions contained in the text tutorial for the same exercise – differing only in how they were presented (i.e. video or text). The video tutorial for exercise 1 was 2:50 minutes long. The corresponding text tutorial consisted of approximately 350 words and 10 screenshots (taken from the video). Likewise, the video tutorial for exercise 2 was 3:53 minutes long and the corresponding text tutorial consisted of approximately 400 words and 10 screenshots (taken from the video). Following the tutorial, subjects completed a short test, which required the application of knowledge from the tutorial to solve a problem using Excel. The test consisted of one open-ended question and three multiple-choice questions. To facilitate subjects' use of Excel during the test, the experimental website included a browser-based version of Excel. After the test, subjects completed a short survey measuring their attitudes towards the preceding tutorial. Afterwards subjects completed the second exercise – following the same process of tutorial, test, and survey. Further details about the experimental setup, including the tutorials, test questions, and survey items can be found in the Appendix.

The experiment was a one-factor (tutorial format: video vs. text) within-subjects design. Subjects were randomly assigned to receive one exercise with a video tutorial and one exercise with a text tutorial. Thus, each subject was exposed to both levels of the independent variable (i.e. tutorial format). To counter potential carryover and learning effects, the order of the exercises and the order of the tutorial format (i.e. video or text) were randomized for all subjects.

Using a combination of server log data and subjects' responses, the following dependent variables were measured:

- *Student performance*: Number of correct answers on the test (out of 4 total)
- *Time spent on tutorial*: Amount of time spent on the tutorial (based on server log data)
- *Time spent on test*: Amount of time spent on the test (based on server log data)

- *Perceived time spent on exercise*: Subjective amount of time spent on the exercise (survey item)
- *Perceived difficulty*: Subjective level of perceived difficulty of the exercise (survey item)
- *Perceived helpfulness*: Subjective level of perceived helpfulness of the tutorial (survey item)
- *Enjoyment*: Subjective level of enjoyment in completing the exercise (survey item)
- *Motivation*: Subjective level of motivation to complete the exercise (survey item)
- *Likelihood to recommend tutorial*: Subjective level of likelihood to recommend the tutorial to a friend (survey item)

Moreover, gender, undergraduate major, undergraduate level, general prior knowledge (of Excel), and specific prior knowledge (of the content covered in each exercise) were measured as control factors in this study.

4. RESULTS

A total of $N = 75$ subjects completed the study. Detailed demographics of the sample are presented in Table 1.

Table 1. Sample Demographics

<i>Gender</i>	
Male	50 (67%)
Female	25 (33%)
<i>Undergraduate Level</i>	
Freshman	9 (12%)
Sophomore	24 (32%)
Junior	28 (37%)
Senior	14 (19%)
<i>Undergraduate Major</i>	
Non-CIS	38 (51%)
CIS	37 (49%)

To test if the randomization of subjects to both order of exercises and order of the tutorial format was unbiased, the control factors were entered in a one-way between-subjects multiple analysis of covariance (MANCOVA). No statistically significant effects were found (all *Wilks' Lambda* > .96, $F(2,69) < 1.29$, $p > .28$), suggesting that the randomization was indeed successful.

To identify potential differences between the two exercises, a one-way within-subjects MANOVA testing the effects of exercise (i.e. exercise 1 vs.

exercise 2) on the dependent variables was conducted. A statistically significant effect was found (*Wilks' Lambda* = .60, $F(9,64) = 4.69$, $p < .001$). Multiple paired samples t-tests were used to make post-hoc comparisons. Two statistically significant differences emerged: While subjects spent about one minute less on the test in exercise 1 than on the test in exercise 2 ($M_{Ex1} = 209.72$, $SD_{Ex1} = 166.57$, $M_{Ex2} = 273.53$, $SD_{Ex2} = 218.11$, $t = -2.30$, $p = .02$, all measures in seconds), they also performed significantly better on the test in exercise 1 than on the test in exercise 2 ($M_{Ex1} = 2.68$, $SD_{Ex1} = 1.16$, $M_{Ex2} = 2.11$, $SD_{Ex2} = 1.13$, $t = 3.96$, $p < .001$). No other differences reached statistical significance (all $t_s < 1.22$, $p_s > .23$). This suggests that the test accompanying exercise 1 might have been easier than the test accompanying exercise 2. Apart from this difference, the two exercises had otherwise statistically indistinguishable outcomes with regards to the dependent variables.

Finally, a one-way within-subjects MANOVA was conducted to test the effects of tutorial format (i.e. video vs. text) on the dependent variables. No statistically significant effect was found (*Wilks' Lambda* = .85, $F(9,64) = 1.29$, $p = .26$).

5. DISCUSSION

The results suggest that tutorial format does not cause any differences in the dependent variables. In other words, whether subjects received a video tutorial or a text tutorial did not affect their performance, time spent on tutorial, time spent on test, perceived time spent on exercise, perceived difficulty, perceived helpfulness, enjoyment, motivation, or likelihood to recommend the tutorial.

These results contradict previous research, which found that video tutorials lead to better student performance than text tutorials (Lloyd and Robertson, 2012). Comparing this work to the previous research, it appears that potential differences in the length of the video tutorials may influence the effect on student performance. Whereas the average video length in this study was 3:16 minutes, the average video length in the previous research was 12 minutes (Lloyd and Robertson, 2012). However, this study also lends support to previous work, which found that video tutorials and text tutorials do not differ with regards to their effect on student performance (Breimer, Cotler, and Yoder, 2012). The average video duration in the study by Breimer and colleagues was 35

minutes, which is significantly longer than the average video duration in the present study.

This research is among the first to show that student attitudes appear to be insensitive to differences in tutorial format. However, it is important to point out that subjects were not asked directly which tutorial format they prefer – as this might be influenced by previous experiences or general preferences. Instead, the present work compared specific student attitudes after each exercise was completed. Clearly, future research is needed to further investigate if and to what extent this finding can be replicated in other contexts.

Future research is also needed to address some of the limitations of this study. In particular, subjects participated in the experiment for extra credit. As such, the experiment was not part of the normal classroom routine. Consequently future work should integrate the experimental setup into the regular classroom. Moreover, the number, duration, and subject matter of the tutorials may influence the relative effectiveness of video or text tutorials. Future work may wish to expand and test for differences across a wider range and number of tutorials. Lastly, it is possible that the sample used in this study is not representative of the larger body of undergraduate students in the United States. Future research should capture additional psychological measures, such as learning style, to describe and control potential sample-specific differences.

These limitations notwithstanding, the present research suggests that educators should carefully consider the additional effort and cost involved in creating and implementing video tutorials. The current trend among online learning systems and MOOCs to use videos extensively may be driven by considerations unrelated to student attitudes or performance. As such, educators and instructional designers should not base their decision to create or implement video tutorials on the false belief that video tutorials are inherently better than text tutorials.

6. CONCLUSION

Does tutorial format (i.e. video or text) affect student attitudes and performance in online computing education? The present study answers this question using a single-factor within-subjects experiment varying tutorial format while keeping the information across

tutorial formats constant. As part of an undergraduate Computer Information Systems course subjects were randomly assigned to complete two Excel exercises: one with a video tutorial and one with a text tutorial. The instructions contained in the video tutorial for an exercise were identical to the instructions contained in the text tutorial for the same exercise – differing only in how they were presented. Following each tutorial, subjects completed a short test and a survey. Findings suggest that tutorial format does not cause significant differences in student performance, time spent on tutorial, time spent on test, perceived time spent, perceived difficulty, perceived helpfulness, enjoyment, motivation, or likelihood to recommend the tutorial. In short, tutorial format appears to be unrelated to student attitudes and performance in online computing education. Consequently, educators and instructional designers are well advised to look beyond the current trend to use video tutorials and instead make choices that minimize the effort and cost involved in creating and implementing tutorials.

7. REFERENCES

- Breimer, E., Cotler, J., & Yoder, R. (2012). Video vs. Text for Lab Instruction and Concept Learning. *Journal of Computing Sciences in Colleges*, 27(6), 42-48.
- Giannakos, M. N. (2014). Exploring the Video-Based Learning Research: A Review of the Literature. *British Journal of Educational Technology*, 44(6), E191-E195.
- Hansch, A., Hillers, L., McConachie, K., Newman, C., Schildhauer, T., & Schmidt, P. (2015). Video and Online Learning: Critical Reflections and Findings from the Field. HIIG Discussion Paper Series No. 2015-02.
- Lee, M., Pradhan, S., & Dalgarno, B. (2008). The Effectiveness of Screencasts and Cognitive Tools as Scaffolding for Novice Object-Oriented Programmers. *Journal of Information Technology Education*, 7, 61-80.
- Lloyd, S., & Robertson, C. (2012). Screencast Tutorials Enhance Student Learning of Statistics. *Teaching of Psychology*, 39(1), 67-71.
- Tekinarslan, E. (2013). Effects of Screencasting on the Turkish Undergraduate Students' Achievement and Knowledge Acquisitions in Spreadsheet Applications. *Journal of Information Technology Education: Research*, 12, 271-282.
- Yousef, A., Chatti, M., & Schroeder, U. (2014). Video-Based Learning: A Critical Analysis of The Research Published in 2003-2013 and Future Visions. Proceedings of the Sixth International Conference on Mobile, Hybrid, and On-line Learning (eLmL 2014), 112-119

APPENDIX: MATERIALS

EXERCISE 1

VIDEO TUTORIAL: <https://www.youtube.com/watch?v=eV5P8rfXZck> (2:50 min)

TEXT TUTORIAL

In this tutorial you'll learn how to use the LEFT and SEARCH functions to extract and copy text strings into separate cells. Please pay close attention to the following instructions.

Introduction

	A	B	C
1	E-Mail	Username	
2	jdod@domain.com		
3	bsmith@domain.com		
4	rmkentley@domain.com		
5	pconnor@domain.com		
6			

This example demonstrates how to extract the username from an e-mail address. An e-mail address consists of two parts: the username (e.g. jdod) and the domain (e.g. domain.com). The two parts are separated by an @ sign. We're going to use two functions to extract the username: The LEFT function and the SEARCH function.

Step 1

	A	B	C
1	E-Mail	Username	
2	jdod@domain.com	=LEFT(A2,4)	
3	bsmith@domain.com		
4	rmkentley@domain.com		
5	pconnor@domain.com		
6			

The LEFT function returns the first characters in a text string. So, for example, LEFT(A2, 4) returns the first 4 characters of the text string in cell A2, which is "jdod".

	A	B	C
1	E-Mail	Username	
2	jdod@domain.com	jdod	
3	bsmith@domain.com	bsmi	
4	rmkentley@domain.com	rmke	
5	pconnor@domain.com	pcon	
6			
7			

When we copy that formula in the remaining cells, we always get the first 4 characters of the cells in column A. However, the problem is that the usernames are not always 4 characters long.

Step 2

	A	B	C	D
1	E-Mail	Username		
2	jdod@domain.com	=SEARCH("@",A2)		
3	bsmith@domain.com			
4	rmkentley@domain.com			
5	pconnor@domain.com			
6				

We have to change the formula to automatically account for the number of characters there are before the @ sign. To do that, we use the SEARCH function. The SEARCH function returns the position of a specific character in a text string. For example, SEARCH("@", A2) returns the position of the @ sign in cell A2.

	A	B	C	D
1	E-Mail	Username		
2	jdod@domain.com	5		
3	bsmith@domain.com			
4	rmkentley@domain.com			
5	pconnor@domain.com			
6				

Notice the formula returns the number 5, as the @ sign is at the fifth position in cell A2. Now we can use the SEARCH function within the LEFT function to determine how many characters to return.

Step 3

	A	B	C	D
1	E-Mail	Username		
2	jdod@domain.com	=LEFT(A2,SEARCH("@",A2))		
3	bsmith@domain.com			
4	rmkentley@domain.com			
5	pconnor@domain.com			
6				

So then LEFT(A2, SEARCH("@", A2)) returns the first number of characters in cell A2, based on the position of the @ sign in cell A2.

	A	B	C	D
1	E-Mail	Username		
2	jdod@domain.com	jdod@		
3	bsmith@domain.com			
4	rmkentley@domain.com			
5	pconnor@domain.com			
6				

Step 4

LEFT		fx =LEFT(A2,SEARCH("@",A2)-1)			
	A	B	C	D	E
1	E-Mail	Username			
2	jdod@domain.com	=LEFT(A2,SEARCH("@",A2)-1)			
3	bsmith@domain.com				
4	rmkentley@domain.com				
5	pconnor@domain.com				
6					

We must reduce the result of the SEARCH function by 1 character. To do that, we edit the function and add "-1" directly after the SEARCH function, but still within the LEFT function.

B2		fx =LEFT(A2,SEARCH("@",A2)-1)			
	A	B	C	D	E
1	E-Mail	Username			
2	jdod@domain.com	jdod			
3	bsmith@domain.com				
4	rmkentley@domain.com				
5	pconnor@domain.com				
6					

Notice the formula now returns "jdod," which is exactly what we want.

Finish

B2		fx =LEFT(A2,SEARCH("@",A2)-1)			
	A	B	C	D	E
1	E-Mail	Username			
2	jdod@domain.com	jdod			
3	bsmith@domain.com	bsmith			
4	rmkentley@domain.com	rmkentley			
5	pconnor@domain.com	pconnor			
6					
7					

We copy the formula to the remaining cells in column B. Notice the final result is a clean list of usernames.

TEST (EXERCISE 1)

This exercise tests your understanding of the LEFT and SEARCH functions covered in this tutorial.

Question 1

Below you are given a list of names. Your task is to write a formula in cell B2 that automatically extracts the last name from the name in cell A2. Use the interactive spreadsheet below to practice. (The interactive spreadsheet shown below is embedded via an iFrame linking to an online Excel file via <http://sheet.zoho.com/view.do?url=...>)

What formula did you type into cell B2 above?
 (Open-ended question; correct answer is
 "=LEFT(A2;SEARCH(",",A2)-1)", without quotations)

Question 2

What will be the result of the formula in cell B2 below?

LEFT		fx =LEFT(A2,4)			
	A	B	C	D	E
1	Location	City			
2	Hamden, CT	=LEFT(A2,4)			
3	New York, NY				
4	Boston, MA				
5					

- a) Hamd (correct answer)
- b) Hamden
- c) Hamden,
- d) Hamden, CT
- e) None of the above

Question 3

What will be the result of the formula in cell B2 below?

LEFT		fx =LEFT(A2,SEARCH(",",A2))				
	A	B	C	D	E	F
1	Location	City				
2	Hamden, CT	=LEFT(A2,SEARCH(",",A2))				
3	New York, NY					
4	Boston, MA					
5						

- a) Hamd
- b) Hamden
- c) Hamden, (correct answer)
- d) Hamden, CT
- e) None of the above

Question 4

What will be the result of the formula in cell B2 below?

	A	B	C	D	E	F
1	Location	City				
2	Hamden, CT	=LEFT(A2,SEARCH(",",A2)-1)				
3	New York, NY					
4	Boston, MA					
5						

- a) Hamd
- b) Hamden (correct answer)
- c) Hamden,
- d) Hamden, CT
- e) None of the above

SURVEY (EXERCISE 1)

What was your previous knowledge of the content covered in Exercise 1?
 (None – Poor – Fair – Good – Excellent)

How difficult was the content covered in Exercise 1 for you?
 (Very difficult – Difficult – Neutral – Easy – Very easy)

How motivated were you to complete Exercise 1?
 (Not at all motivated – Slightly motivated – Somewhat motivated – Moderately motivated – Very motivated)

How enjoyable was Exercise 1?
 (Not at all enjoyable – Slightly enjoyable – Somewhat enjoyable – Moderately enjoyable – Very enjoyable)

How helpful were the instructions in Exercise 1?
 (Not at all helpful – Slightly helpful – Somewhat helpful – Moderately helpful – Very helpful)

How likely is it that you would recommend a tutorial like the one in Exercise 1 to a friend?
 (Not at all likely – Slightly likely – Somewhat likely – Moderately likely – Very likely)

How long did it take you to complete Exercise 1? (Provide an estimate in minutes.)
 (Open-ended question)

EXERCISE 2

VIDEO TUTORIAL: <https://www.youtube.com/watch?v=NpQTu30BwT0> (3:52 min)

TEXT TUTORIAL

Instructions

In this tutorial you'll learn how to use the INDEX and MATCH functions to lookup values in a table. Please pay close attention to the following instructions.

Introduction

	A	B	C
1	Employee	Extension	
2	Connor, Peter	23	
3	Dod, Jane	44	
4	Kentley, Michelle R.	18	
5	Smith, Bob	31	
6			
7	Lookup by extension		
8	Extension:	18	
9	Employee:		
10			

This example demonstrates how to lookup an employee by their extension number. We're going to use two functions to do that: The INDEX function and the MATCH function.

Step 1

	A	B	C	D
1	Employee	Extension		
2	Connor, Peter	23		
3	Dod, Jane	44		
4	Kentley, Michelle R.	18		
5	Smith, Bob	31		
6				
7	Lookup by extension			
8	Extension:	18		
9	Employee:	=INDEX(A1:B5,4,1)		
10				

The INDEX function returns a value from a table, given a row and column number. So, for example, INDEX(A1:B5, 4, 1) returns the value from the table A1:B5 where the row number is 4 and the column number is 1.

B9			
A	B	C	D
1	Employee	Extension	
2	Connor, Peter	23	
3	Dod, Jane	44	
4	Kentley, Michelle R.	18	
5	Smith, Bob	31	
6			
7	Lookup by extension		
8	Extension:	18	
9	Employee:	Kentley, Michelle R.	
10			

Notice the formula returns "Kentley, Michelle R.," which is located in row 4, column 1, in table A1:B5. However, for our example, we would like to automate the formula, so that we don't have to specify which row number we are looking for.

Step 2

MATCH			
A	B	C	D
1	Employee	Extension	
2	Connor, Peter	23	
3	Dod, Jane	44	
4	Kentley, Michelle R.	18	
5	Smith, Bob	31	
6			
7	Lookup by extension		
8	Extension:	18	
9	Employee:	=MATCH(18,B1:B5,0)	
10			

To do that, we use the MATCH function. The MATCH function returns the row number of a search item in a column. So, for example, MATCH(18, B1:B5, 0) returns the row number that contains the value 18 in column B1:B5. The last argument in the formula, 0, just tells the function to find the first row that is exactly equal to the search item.

B9			
A	B	C	D
1	Employee	Extension	
2	Connor, Peter	23	
3	Dod, Jane	44	
4	Kentley, Michelle R.	18	
5	Smith, Bob	31	
6			
7	Lookup by extension		
8	Extension:	18	
9	Employee:	4	
10			

Notice the formula returns 4, because the value 18 is located in the 4th row of column B1:B5. Now we can use the MATCH function within the INDEX function to automatically find the extension number we are looking for.

Step 3

INDEX				
A	B	C	D	E
1	Employee	Extension		
2	Connor, Peter	23		
3	Dod, Jane	44		
4	Kentley, Michelle R.	18		
5	Smith, Bob	31		
6				
7	Lookup by extension			
8	Extension:	18		
9	Employee:	=INDEX(A1:B5,MATCH(18,B1:B5,0),1)		
10				

So then INDEX(A1:B5, MATCH(18, B1:B5, 0), 1) returns the value from table A1:B5, where the row contains the value 18, and the column number is 1.

B9				
A	B	C	D	E
1	Employee	Extension		
2	Connor, Peter	23		
3	Dod, Jane	44		
4	Kentley, Michelle R.	18		
5	Smith, Bob	31		
6				
7	Lookup by extension			
8	Extension:	18		
9	Employee:	Kentley, Michelle R.		
10				

Notice the formula returns again "Kentley, Michelle R.," which is the name of the employee whose extension is 18. However, we don't want to hard code the extension 18 into our formula, because we might want to look up other extensions in the future.

Step 4

INDEX				
A	B	C	D	E
1	Employee	Extension		
2	Connor, Peter	23		
3	Dod, Jane	44		
4	Kentley, Michelle R.	18		
5	Smith, Bob	31		
6				
7	Lookup by extension			
8	Extension:	18		
9	Employee:	=INDEX(A1:B5,MATCH(B8,B1:B5,0),1)		
10				

To do that, we replace the value 18 in the formula with a reference to cell B8. Given that cell B8 currently contains the value 18, the result should stay the same.

B9				
A	B	C	D	E
1	Employee	Extension		
2	Connor, Peter	23		
3	Dod, Jane	44		
4	Kentley, Michelle R.	18		
5	Smith, Bob	31		
6				
7	Lookup by extension			
8	Extension:	18		
9	Employee:	Kentley, Michelle R.		
10				

Notice the formula returns "Kentley, Michelle R.," which is exactly what we want.

Finish

B9				
A	B	C	D	E
1	Employee	Extension		
2	Connor, Peter	23		
3	Dod, Jane	44		
4	Kentley, Michelle R.	18		
5	Smith, Bob	31		
6				
7	Lookup by extension			
8	Extension:	44		
9	Employee:	Dod, Jane		
10				

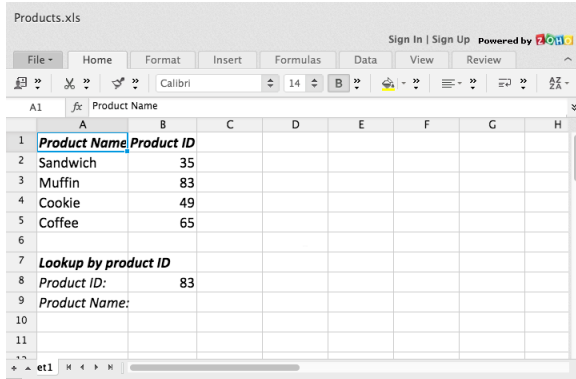
To test if our formula behaves as expected, we change the extension number in cell B8 to e.g. 44. Notice the formula returns "Dod, Jane," which is the name of the employee whose extension is 44.

TEST (EXERCISE 2)

This exercise tests your understanding of the INDEX and MATCH functions covered in this tutorial.

Question 1

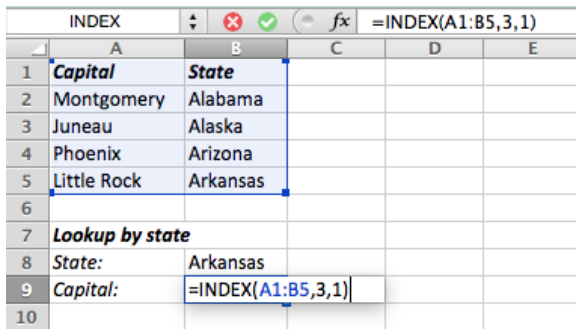
Below you are given a table of product names and product IDs. Your task is to write a formula in cell B9 that automatically returns the product name for any product ID that is specified in cell B8. Use the interactive spreadsheet below to practice. (The interactive spreadsheet shown below is embedded via an iFrame linking to an online Excel file via <http://sheet.zoho.com/view.do?url=...>)



What formula did you type into cell B9 above?
 (Open-ended question; correct answer is
 "=INDEX(A1:B5;MATCH(B8;B1:B5;0);1)", without quotations)

Question 2

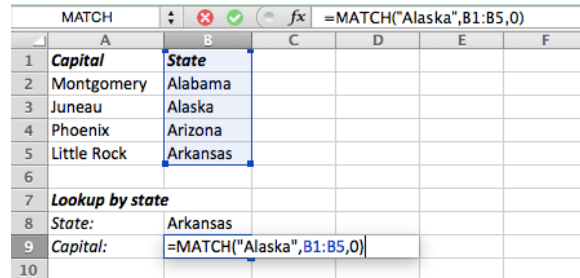
What is the result of the formula in cell B9 below?



- a) Alaska
- b) Juneau (correct answer)
- c) Arizona
- d) Little Rock
- e) None of the above

Question 3

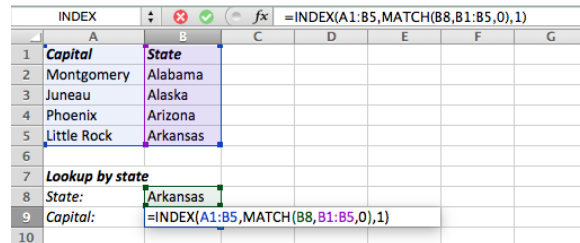
What is the result of the formula in cell B9 below?



- a) 2
- b) 3 (correct answer)
- c) Juneau
- d) Alaska
- e) None of the above

Question 4

What is the result of the formula in cell B9 below?



- a) Arkansas
- b) Little Rock (correct answer)
- c) Phoenix
- d) Alabama
- e) None of the above

SURVEY QUESTIONS (EXERCISE 2)

Analog to survey questions for exercise 1 (see above).

DEMOGRAPHIC QUESTIONS

What is your general knowledge of spreadsheet applications (such as Excel)?
 (None – Poor – Fair – Good – Excellent)

What is your gender?
 (Male – Female)

What is your major?
 (Open-ended question)

What is your undergraduate level?
 (Freshman – Sophomore – Junior – Senior)

