Technical Knowledge and Ability: Expectation Verses Reality the Dunning-Kruger Effect

Odai Khasawneh
Lecturer
University of Wisconsin-Milwaukee
2311 E Hartford Ave, Milwaukee, WI 53211
United States of America

Abstract

Previous studies argue that most people tend to overestimate their knowledge, ability and skill level. This paper examines Dunning-Kruger effect on students' grade expectation in a freshman level course. The outcome of this study can help students, instructors, and employers. Method: A survey was used to collected students anticipated grade in different parts of the class; exams, assignments, and projects. The data was collected in two rounds, once at the beginning of the semester and once at the end of the semester; 164 and 117 participants respectively. At the end of the semester, responses were compared to the actual grades received in the class using t test and one sample t test. Data analysis revealed that, students tend to overestimate their knowledge and ability in both times. Finally, the study provides a reasoning for the outcome of the study.

Keywords: Dunning-Kruger effect, overestimate ability, expected grades.

1. Introduction

Talent acquisition is a major issue that companies face whenever they want to hire new employees. Many companies utilize campus recruiting as a major technique to attract new talents to work with their companies (TalentLyft, 2018). During the screening process, it is assumed that job applicants know their level of competence in a certain technical skill, but is that really the case? Are people mindful of their accurate level of knowledge and ability?

Examining whether overestimating knowledge and ability is an issue that is currently present in young generation; Gen Z, might have a major impact on companies recruiting efforts. It might cause companies or recruiters to adjust their assessment or interview questions to address the Dunning-Kruger effect.

Overestimating, or underestimating, one's own knowledge and ability might have a major impact on his or her professional career. For that reason, recruiters need to know or be conscious of the Dunning-Kruger effect; sometimes referred to as self-overestimation. In short, Dunning-Kruger effect argues that individuals who are relatively incompetent or unskilled are most likely to overestimate their knowledge and ability.

The current study examines that concept and whether it holds true with young generation that is joining the workplace.

1.1. Dunning-Kruger

The average individual tends to rate himself/herself above average, which goes against what is demonstrated in descriptive statistic (Alicke, Klotz, Breitenbecher, Yurak, & Vredenburg, 1995). That overestimation happens in a variety of areas, for example in reading comprehension, Maki, Jonas, and Kallod (1994) argue that inexpert readers lack the ability to assess their text comprehension. Drivers who failed their driving exam are less accurate when it comes to assessing their driving ability (Kunkel, 1971).

Novices are inaccurate to estimate the difficulty of problems in physics (Chi et al., 1982) or positioning their chess pieces on the chessboard (Chi, 1978). Kruger and Dunning (2009) argue that beginners are less mindful about their abilities than experts, they state that "the skills that engender competence in a particular domain are often the very same skills necessary to evaluate competence in that domain-one's own or anyone else's" (Kruger, Dunning, 2009, p.30)

Previous studies examined class performance and classwork. For example, studies show that average students tend to have less accurate assessment of their performance in classwork (e.g. Moreland, Miller, & Laucka, 1981; Shaughnessy, 1979; Sinkavich, 1995). When it comes to technical skills, it is vital to examine whether students can accurately assess their knowledge and ability. The current study will add to the existing body of literature and examines the Dunning-Kruger effect in a management of information system (MIS) class. The current study argues that in case Dunning-Kruger effect is present in students taking technical classes, then students should be informed at the beginning of these classes about the overestimation issue so they would have a more realistic assessment of their knowledge and ability. Hopefully that can prepare them to the class, and they can invest more time and effort in learning the skills.

1.2. The study

The class has multiple parts, so in addition to the MIS topics, students are expected to perform technical assignments and projects using Microsoft Access and Excel. The final grade for the class is based on students' performance in all three parts. So, the study is interested in students' estimation of their grade in the whole class, assignments, projects, access, and excel.

The study will examine the following predictions (null hypothesis)

1) Students can accurately estimate their expected final grade.
2) Students can accurately estimate their expected assignment grade
3) Students can accurately estimate their expected project grade
4) Students can accurately estimate their expected MS Access grade
5) Students can accurately estimate their expected MS Excel grade

In addition to the previous predictions, the study will exam whether students expected grade is related to students' estimated knowledge and ability in Microsoft Access and Excel.

- There will be no difference between students' MS Access grade expectation and their MS Access knowledge and ability expectation
- There will be no difference between students' MS Excel grade expectation and their MS Excel knowledge and ability expectation

The data was collected at the beginning of the semester then again at the end of the semester. The study assumes that after going through the syllabus and getting its content explained in details students might be able to evaluate his/her knowledge and ability then estimate, guesstimate, the grades that he/she expect to receive at the end of the semester. Toward the end of the semester, students will pe allowed to estimate their expected grades again. However, at this point, they have been in the class for more than 12 weeks so they should have a more accurate estimation to their knowledge and ability. Students estimation at the beginning of the semester might not be accurate, but the second round of the survey; at the end of the semester, should be a lot more accurate since all parts are graded and posted.

The aforementioned predictions will be tested against the actual grade received in the class.

2. Method

A self-rating survey was used to measure students' grade expectations in the following areas: Assignment, Projects, Excel, Access, and the total final grade. A likert-scale from 1-100 with 10 points intervals was utilized in the survey. The same survey was used at the beginning of the semester; first two weeks, then again at the end of the semester; last two weeks. After the semester was over, students' responses (sample) were compared to the actual grades received by the whole class (main population). Qualtrics was used to host the survey; both times, a link was shared with students to guide them to the survey. To guarantee the anonymity, the survey did not collect traceable information.

2.1. Data collection

First two weeks

The first round of the survey took place during the first two weeks of the class. A 165 participants took the survey; one response was dropped since it was not completed. The majority of the sample were 18-20 years old; 73.3%, and 81.8% of the sample are in a business major; Accounting, Finance, Human Resources, Marketing, Business Communication, Supply Chain Management. More than half of the sample reported that they are working; 51.5%, and 15.2% were unemployed but actively looking. The sample population reported that 53.3% are males and 46.1% are females.

Last two weeks

The second round of the survey took place during the last two weeks of the class. A 117 participants took the survey; two responses were dropped since they were not completed. The majority of the sample were 18-20 years old; 70.1%, and 85.5% of the sample are in a business major; Accounting, Finance, Human Resources, Marketing, Business Communication, Supply Chain Management. More than half of the sample reported that they are working; 51.3%, and 14.5% were unemployed but actively looking. The sample population reported that 53.8% are males and 45.3% are females.

3. Data Analysis

3.1. First two weeks
In the first round of the survey, students estimated grades are presented in Table 1and illustrated in Figure 1.

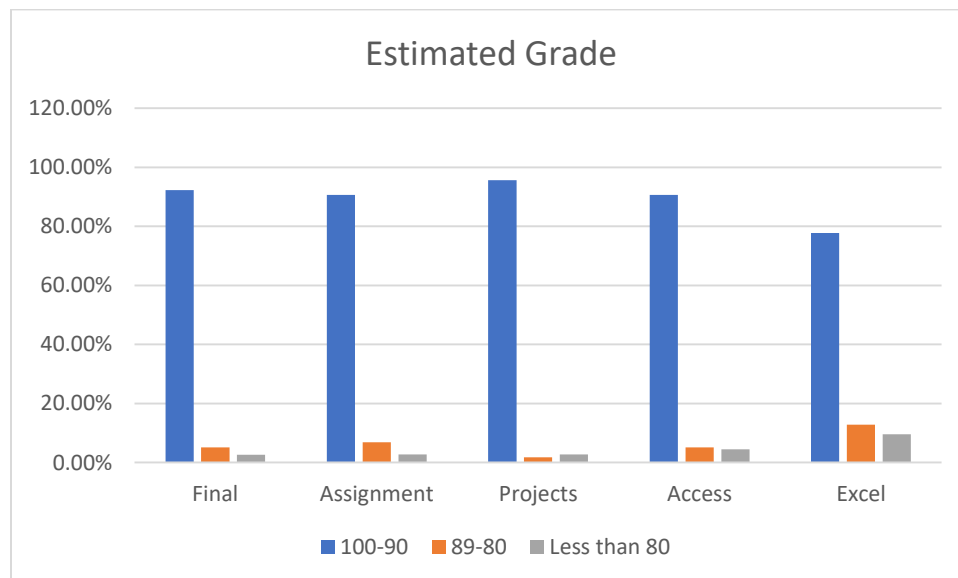| Expected grade	100-90	89-80	Less than 80
Final	95.8%	4.3%	0%
Assignment	97.0%	3%	0%
Projects	93.9%	6.1%	0%
Access	94.5%	5.5%	0%
Excel	87.8%	9.1%	3%

Table 1 Estimated Grade First Two Weeks.

Figure 1 Estimated Grade First Two Weeks

In the survey, one question asked students about their expected grade in Microsoft Access and another questions about their ability when it comes Microsoft Access. Another set of two questions asked about Microsoft Excel; one question about expected grade and another questions about estimate knowledge and ability. It was expected that the answer to the two questions would be the same, however, the responses for each set of these two questions were different so a paired t-test was performed to examine whether the difference in response was statistically significant.

3.1.1.   Access (Grade vs. Ability)

The study null hypothesis was

There will be no difference between students' MS Access grade expectation and their MS Access knowledge and ability expectation

A two-tailed paired sample t test revealed that students overestimate their grade in MS Access (M=9.43, SD=.598) even though they rate themselves lower when it comes to knowledge and ability in MS Access (M=6.96, SD=2.833). Therefore, the null hypothesis of no difference between students' MS Access grade expectation and MS Access knowledge and ability was rejected, *t*(163)=11.051, p<.001.

3.1.2.   Excel (Grade vs. Ability)

The study null hypothesis was

There will be no difference between students' MS Excel grade expectation and their MS Excel knowledge and ability expectation

A two-tailed paired sample t test revealed that students overestimate their grade in MS Excel (M=9.26, SD=1.223) even though they rate themselves lower when it comes to knowledge and ability in MS Excel (M=7.63, SD=2.57). Consequently, the null hypothesis of no difference between students' MS Excel grade expectation and MS Excel knowledge and ability was rejected, *t*(163)=8.847, p<.001.

3.2. Last two weeks

In the last two weeks, at this point of the semester, it was expected that the results should be more accurate in reflecting the actual grades that the students received since all of the grades are posted at that time. Below, Table 2, are the grades estimation as reported by students

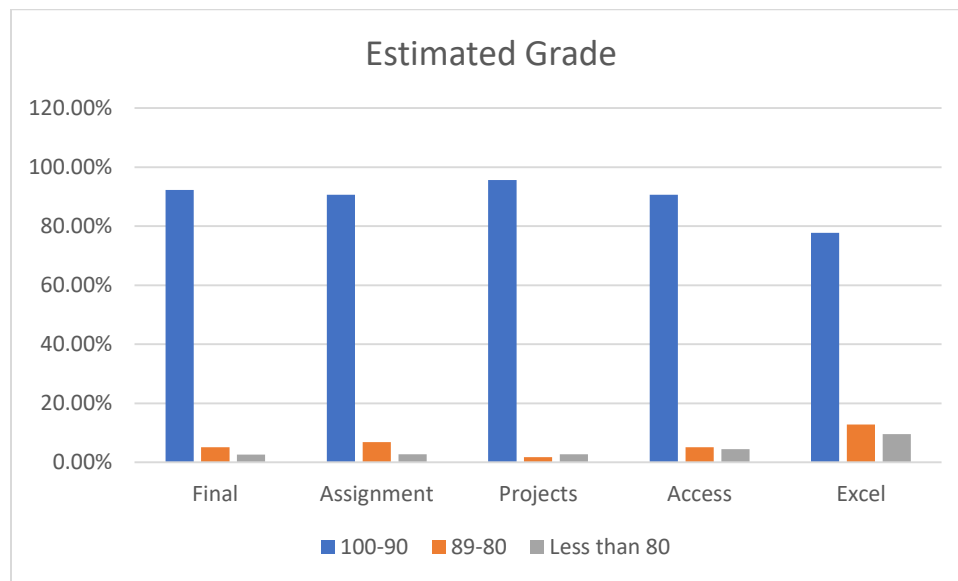| Expected grade	100-90	89-80	Less than 80
Final	92.3%	5.1%	2.6%
Assignment	90.6%	6.8%	2.7%
Projects	95.6%	1.7%	2.7%
Access	90.6%	5.1%	4.4%
Excel	77.7%	12.8%	9.5%

Table 2 Estimated Grade Last Two Weeks

Figure 2 Estimated Grade Last Two Weeks

Students response to grade versus knowledge ability in Access and Excel were inconsistent. So, again, a paired t-test was performed to check whether the difference between students' response to expected grade versus knowledge and ability was statistically significant.

3.2.1. Access (Grade vs. Ability)

The study's null hypothesis was

There will be no difference between students' MS Access grade expectation and their MS Access knowledge and ability expectation

A two-tailed paired sample t test revealed that students overestimate their grade in MS Access (M=9.46, SD=1.2) even though they rate themselves lower when it comes to knowledge and ability in MS Access (M=8.87, SD=1.483). The null hypothesis of no difference between students' MS Access grade expectation and MS Access knowledge and ability was rejected, $t(116)=5.234$, $p<.001$.

3.2.2. Excel (Grade vs. Ability)

There will be no difference between students' MS Excel grade expectation and their MS Excel knowledge and ability expectation

A two-tailed paired sample t test revealed that students overestimate their grade in MS Excel (M=9.32, SD=1.243) even though they rate themselves lower when it comes to knowledge and ability in MS Excel (M=8.96, SD=1.329). The null hypothesis of no difference between students' MS Excel grade expectation and MS Excel knowledge and ability was rejected, $t(116)= 4.205$, $p<.001$.

At the end of the semester, the sample responses were tested against the actual grades received in the class; sample versus population.

3.3. Actual grade

The reported grades expectations collected in the first two weeks were different than the responses collected in the last two weeks. However, a quick review of the actual grades received seems to show that the actual grades were on average lower than the expected grades reported by the sample in both timeframes. The following table, Table 3, shows the actual grade received by the population.

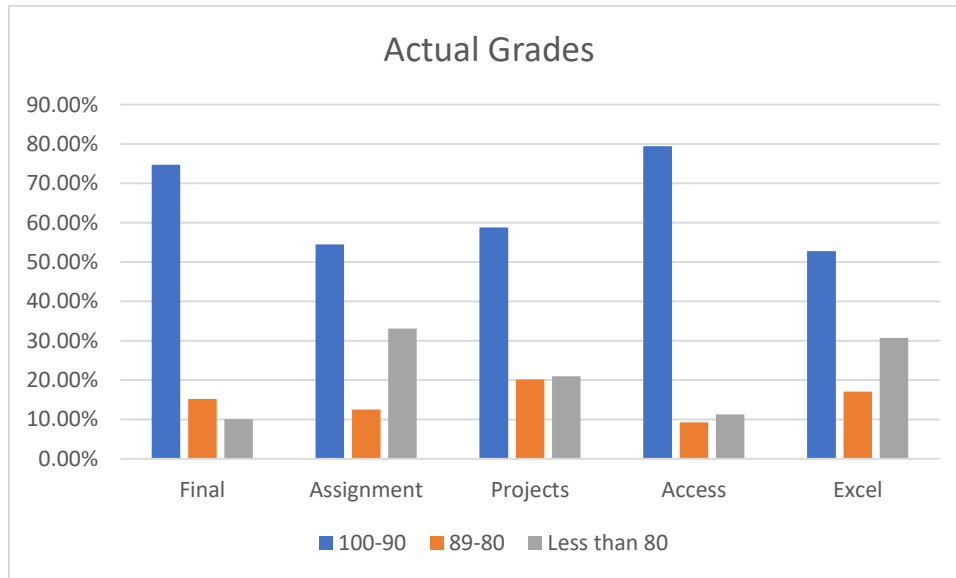| Actual grade	100-90	89-80	Less than 80
Final	74.7%	15.2%	10.1%
Assignment	54.5%	12.5%	33.1%
Projects	58.8%	20.2%	21.0%
Access	79.4%	9.3%	11.3%
Excel	52.74%	17.1%	30.7%

Table 3 Actual Grade

Figure 3 Actual Grades

The following table, Table 4, combines the grade expectations in the first two weeks (F), last two weeks (L), then the actual grade (A) received. Figure 4 illustrate the same information

	100-90			89-80			Less than 80		
	F	**L**	**A**	**F**	**L**	**A**	**F**	**L**	**A**
Final	95.8%	92.3%	74.7%	4.3%	5.1%	15.2%	0%	2.6%	10.1%
Assignment	97.0%	90.6%	54.5%	3%	6.8%	12.5%	0%	2.7%	33.1%
Projects	93.9%	95.6%	58.8%	6.1%	1.7%	20.2%	0%	2.7%	21.0%
Access	94.5%	90.6%	79.4%	5.5%	5.1%	9.3%	0%	4.4%	11.3%
Excel	87.8%	77.7%	52.74%	9.1%	12.8%	17.1%	3%	9.5%	30.7%

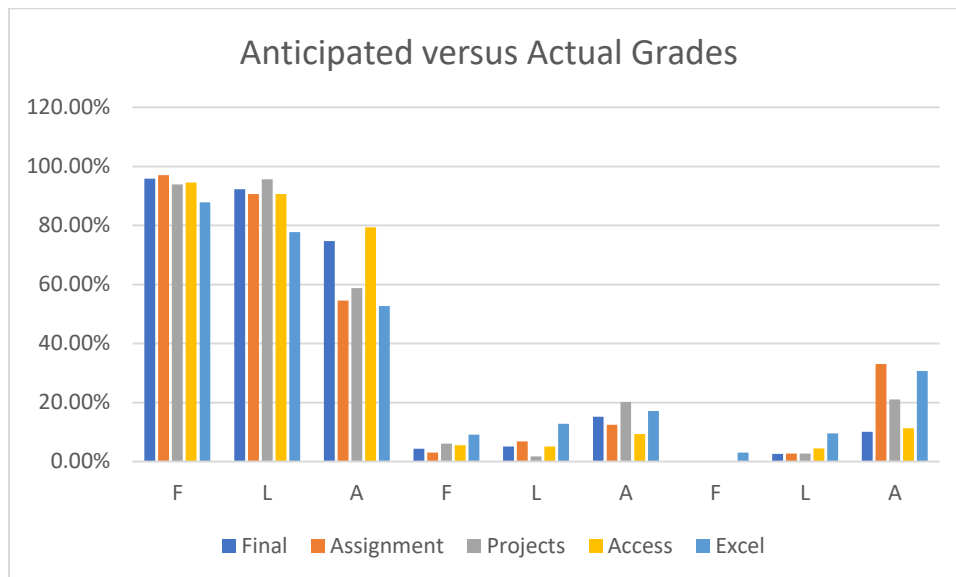**Table 4 Grades expectations vs reality**

Figure 4 Grades expectations vs reality

Even though the numbers in the table seems to support the premise of this study; student overestimate their knowledge and ability in technical topics and skills, the study will conduct a one sample t test to compare the means of the population versus the sample to test whether the observed difference is significant.

The study had five hypotheses that will be examines, each hypothesis will be examined twice; once for the data collected during the first two weeks, then with the data collected during the last two weeks.

3.4. Hypotheses

3.4.1.   The first prediction; null hypothesis, was
         Students can accurately estimate their expected final grade.

First two weeks & last two weeks

A two-tailed one sample t test was performed on the data collected during the first week and the last two weeks. It revealed that students overestimate their final grade in the class; (M=9.51, SD=.581), and (M=9.47, SD=1.039) respectively. The null hypothesis was rejected for both data sets, $t(163)= 14.906$, p<.001, and $t(116)= 6.666$, p<.001.

3.4.2.   The second prediction; null hypothesis, was
         Students can accurately estimate their expected assignment grade

First two weeks & last two weeks

A two-tailed one sample t test was performed on both sets of data and it revealed that students overestimate their final grade in the class; (M=9.65, SD=.540), and (M=9.50, SD=1.172) respectively. The null hypothesis was rejected for both data sets, $t(163)= 42.145$, p<.001, and $t(116)= 15.087$, p<.001.

3.4.3.   The third prediction; null hypothesis, was
         Students can accurately estimate their expected project grade

First two weeks & last two weeks

A two-tailed one sample t test was performed on both sets of data and it revealed that students overestimate their final grade in the class; (M=9.55, SD=.048), and (M=9.57, SD=1.085) respectively. The null hypothesis was rejected for both data sets, $t(163)= 27.217$, p<.001, and $t(116)= 13.083$, p<.001.

3.4.4.   The fourth prediction; null hypothesis, was
         Students can accurately estimate their expected MS Access grade

First two weeks & last two weeks

A two-tailed one sample t test was performed on both sets of data and it revealed that students overestimate their final grade in the class; (M=9.43, SD=.598), and (M=9.46, SD=1.200) respectively. The null hypothesis was rejected for both data sets, $t(163)= 9.488$, p<.001, and $t(116)= 4.250$, p<.001.

3.4.5.   The final prediction; null hypothesis, was
         Students can accurately estimate their expected MS Excel grade

First two weeks & last two weeks

A two-tailed one sample t test was performed on both sets of data and it revealed that students overestimate their final grade in the class; (M=9.26, SD=1.223), and (M=9.32, SD=1.243) respectively. The null hypothesis was rejected for both data sets, $t(163)= 15.942$, p<.001, and $t(116)= 13.714$, p<.001.

4. Discussion

Overestimating one's knowledge and ability is more common than anyone would like to admit. However, when recruiting or applying for a new job, having somewhat accurate assessment of one's abilities is very important. This is especially important when it comes to technical skills, knowledge and ability since the new position might requires the use of these skills immediately.

The study started with several assumptions; null hypotheses, that were based on the premise that students can accurately estimate their grades in different parts of the class. Accepting these assumptions would mean that students are well prepared to estimate their grades, knowledge and ability in technical classes. However, all the assumptions were rejected which agrees with the findings of previous studies by Moreland, Miller, & Laucka (1981), Shaughnessy (1979), and Sinkavich (1995).

It was anticipated that students' expected grade would not be accurate at the beginning of semester and that the null hypotheses would be rejected. But the results from the second round of survey was surprising; and alarming. The data shows that overestimating of knowledge and ability was still an issue even after more than 12 weeks in class and finishing 12 assignments and 12 projects.

This might have happened because students at the end of the semester might have built a higher level of componence; compared to what they knew at the beginning of the semester. With this new sense of competence, many students felt comfortable to report a higher-grade expectation; even if it is overestimated, because they know more at this point than what they started with. Another factor that might also played a rule in this, might be the fact the COVID-19 pandemic hits during the data collection. To accommodate for this sudden change, the lowest two assignments, two projects, and exam were dropped. This might have led some students to assume that their grade will increase significantly. Also, student tend to ignore the fact that other students might be more proficient than them, this agrees with Kruger's (1999) study that argues that most people believe that their ability is above average when compared to the ability of others.

Finally, based on the finding of the study, it might be good practice to inform students at the very beginning of the semester about this misconception; overestimating one's knowledge and ability. This is especially important in technical classes since students might have to use these skills shortly after they start a new job. This is a major issue that students, instructors, and employers should be aware of in order to avoid some of the negative consequences that might take place. Instructors can use the information provided in this paper to enhance the learning experience of students in technical classes. They can make adjustments to their classwork to address this issue and make students aware of it. This will build a sense of

5. Limitation

This study is not without limitations. One of these limitations is that it was impossible to link the sample responses; from the first two weeks survey, last two week, and final grade. The original study was designed to link responses using a unique ID created specifically for each participant. However, almost halfway through the semester; week eight, the COVID-19 pandemic happened, and classes moved to fully online. That caused many participants not to take the second survey and those who did forgot their unique ID.

that means that students' overestimate/underestimate their knowledge and ability when it comes to technical classes.

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