

Effect of Reflection Prompts on Efficacy, Duration, and Persistence of Assignments

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Investigation of Quantitative Measures of the Effects of Reflection Prompts on the Efficacy, Duration, and Persistence of Assignments

Abstract

This study investigated whether the presence of a reflection prompt in an assignment affects the perceived usefulness of the assignment by students (efficacy), the amount of time it takes to complete the assignment (duration), and whether it affects a student's propensity to engage in reflective behavior in future assignments (persistence). The duration of the assignment in the presence or absence of a reflection prompt is examined as a possible quantitative indicator of the impact of the presence of a reflection prompt under the hypothesis that the presence of a reflection prompt spurs students to spend more time thinking about the assignment. In addition, a Likert scale is employed in an effort to quantitatively measure the effect of the presence of a reflection prompt in an assignment on its efficacy and persistence. The results of this study suggest that there may be a small (but not statistically significant) increase in the efficacy of the assignment when a reflection prompt is present. When students were given two similar assignments a week apart, students who received an assignment containing a reflection prompt during the first week but not the second reported the same level of efficacy of both assignments, which is consistent with the possibility that the presence of a reflection prompt in an assignment may help stimulate the persistence of reflective behavior even when the reflection prompt is absent in subsequent assignments. The duration of the assignment was found, on average, to be the same or longer when a reflection prompt is present. The standard deviations in the measured values of the efficacy and the duration of assignments were found to be smaller when a reflection prompt was present in the assignment, suggesting the possibility that the presence of a reflection prompt may help focus students' attention and thinking.

Introduction

The use of reflection in assignments is well-known for stimulating positive learning achievements and professional development in students.¹⁻⁴ This is typically inferred from the analysis of students' long-form written responses to reflection prompts in assignments and projects.^{1,2} This method of analyzing the impact of reflection prompts, however, is largely qualitative and may contain a degree of subjectivity. In this study, it is hypothesized that the presence of a reflective prompt in an assignment will result in students spending more time thinking about the assignment. Hence the duration of an assignment was examined as a possible quantitative indicator of the impact of the presence of a reflection prompt in an assignment. Quantitative measurement of the efficacy of assignments – an evaluation of students' increase in understanding of the purpose of an assignment and of the degree of helpfulness of an assignment in assisting students in making a decision – was performed using a Likert scale. The identification and consideration of more quantitative measures of the efficacy of reflection prompts in concert with qualitative analysis of student responses to reflection prompts is anticipated to highlight and reinforce the significant impacts of reflection prompts.

Methodology

Two sections of a freshman general engineering class (ENGR 110, Introduction to Engineering) at California Polytechnic State University (Cal Poly) participated in this study, with 40 students enrolled in the first section and 32 students enrolled in the second section. The two assignments used to study the effect of a reflective prompt are similar in that students are asked in both assignments to attend a meeting of their choosing to interview someone using two open-ended questions they have developed beforehand. The first assignment focused on the importance of engineering extra-curricular activities as opportunities for learning, networking, and adding breadth to their professional development. This assignment was due two weeks after it was assigned. In this assignment, students were asked to learn more about an engineering extra-curricular activity by either attending a meeting of an engineering-related extracurricular club of their choosing and interviewing an officer of the club, or by meeting with a professor whose research group they were interested in joining. The assignment then asked students to fill out a worksheet to summarize this experience, with the worksheet being identical between the two sections except for the inclusion of a reflective prompt in the version of the worksheet given to the first section (Appendices A1 and A2). In the worksheet, students were asked to identify the engineering extra-curricular activity they attended and their interviewee, the two open-ended questions they asked and the interviewee's responses, what they learned about the extra-curricular activity, and what they liked and disliked about the extra-curricular activity. The reflective prompt that followed this series of questions encouraged students to review their responses to these questions and see if they helped in deciding whether or not to pursue the extra-curricular activity. The reflective prompt is then followed by two questions evaluating the efficacy of the assignment. The first of these questions asked students whether the assignment increased their understanding of the value of participating in an engineering extra-curricular activity in college, where students responded using a 5-point Likert scale (1 = no increase in understanding, 5 = large increase in understanding). The second question asked if the assignment was helpful for the student in deciding whether or not to pursue the extra-curricular activity they researched, where students also responded using a 5-point Likert scale (1 = not helpful, 5 = very helpful). Students were then asked to indicate the amount of time (in minutes) it took them to complete this written assignment. Comparison of the amount of time to complete the assignment and responses to the two Likert scale questions between the first section (which received the version of the assignment with the reflective prompt) and the second section (which received the version of the assignment without the reflective prompt) is hypothesized to give information about the efficacy and duration of a reflective prompt.

The second of the two assignments focused on students learning more about a department in which they are interested in majoring. This assignment was given to students a week after the first assignment and due a week after the first assignment, allowing students two weeks to complete the assignment. In this assignment, students were asked to interview a professor in the department in which they are interested in majoring to learn more about the department. As with the first assignment, students were asked to develop two open-ended questions designed to learn more about the professor's field prior to conducting their in-person interview with the professor. The worksheet for this second assignment was identical between the two sections except for the inclusion of a reflective prompt in the version of the worksheet given to the second section

(Appendices B1 and B2). Similar to the first assignment, students were asked to identify the department of interest and their interviewee, the two open-ended questions they asked and the interviewee's responses, what they learned about the professor's field, and what they liked and disliked about the department. The reflective prompt that followed this series of questions encouraged students to review their responses to these questions and see if they helped in deciding whether or not to pursue a major in that department. The reflective prompt was again followed by two questions evaluating the efficacy of the assignment. The first of these questions asked students whether the assignment increased their understanding of the value of identifying and engaging with a variety of resources (such as professor and the Cal Poly course catalog) in researching majors, where students responded using a 5-point Likert scale (1 = no increase in understanding, 5 = large increase in understanding). The second question asked if the assignment was helpful for the student in deciding whether or not to pursue a major in the department they researched, where students also responded using a 5-point Likert scale (1 = not helpful, 5 = very helpful). Students were then asked to indicate the amount of time (in minutes) it took them to complete this written assignment. In contrast to the first assignment, this assignment contains a brief exercise whose purpose is to encourage students to identify and schedule courses that are prerequisites to an upper level course they wish to take. Therefore it is expected that the duration of the second assignment may be slightly longer than the duration of the first assignment.

Comparison of the amount of time to complete the assignment and responses to the two Likert scale questions between the two assignments for the second section (where the second section received the version of the second assignment with the reflective prompt) is also hypothesized to give information about the efficacy and duration of a reflective prompt. Performing this comparison between the two assignments for the first section (where the first section received the version of the second assignment without the reflective prompt) is expected to reveal information about the persistence of a reflective prompt. The averages and the standard deviations of the students' responses by section to the questions about the efficacy of each assignment and the time they took to complete each assignment were computed and analyzed for trends with respect to efficacy, duration and persistence. Table 1 summarizes the methodology and underlying hypotheses of this study.

This study was conducted in compliance with Cal Poly's Human Subjects Research Board (HSRB) standards,⁵ which include informed consent, minimized risk, no benefits to survey respondents, equitable selection of survey respondents, confidentiality, respect of vulnerable subjects (disadvantaged, disabled, etc.), and a debriefing.

Results and Discussion

Table 2 shows the average and standard deviation by section of students' responses to the efficacy and duration of the assignment focusing on researching an engineering extra-curricular activity, where only section 1 received an assignment worksheet containing a reflection prompt. One student in section 1 and one student in section 2 did not turn in this assignment.

Table 1. Summary of methodology. Assignment 2 was given to students one week after Assignment 1. Students had two weeks to complete each of Assignments 1 and 2. Comparison of Cells 1 and 2 is hypothesized to give information about the efficacy and duration of a reflective prompt. Likewise, comparison of Cells 2 and 4 is hypothesized to give information about the efficacy and duration of a reflective prompt. Comparison of Cells 1 and 3 is hypothesized to give information about the persistence of a reflective prompt.

	<i>Assignment 1</i>	<i>Assignment 2</i>
<i>Section 1</i> (40 students)	Cell 1: Contains reflective prompt	Cell 2: No reflective prompt
<i>Section 2</i> (32 students)	Cell 3: No reflective prompt	Cell 4: Contains reflective prompt

On average, the students across both sections appeared to take the same amount of time to complete this assignment (35 minutes). However, the magnitude of the standard deviation in the duration of the assignment was smaller for section 1, who received the worksheet with the reflection prompt. The students in section 1 also reported on average slightly higher efficacy of the assignment, although this slight difference between sections in the average perceived assignment efficacy was not statistically significant. As with duration, the magnitude of the standard deviation in the perceived efficacy of the assignment was smaller for the section receiving the reflection prompt.

Two students in section 2 selected a score of 1 (not helpful) on the Likert scale in response to the question about how helpful the assignment was in their decision whether or not to pursue the extra-curricular activity they researched. Both of these students noted in their assignments that they had already decided prior to the assignment to join the extra-curricular activity they researched; hence they selected a score of 1 because the assignment did not influence their decision to pursue the extra-curricular activity.

Table 2. Average and standard deviation by section of students' responses to the efficacy and duration of the engineering extra-curricular activity assignment.

<i>Assignment 1: Engineering Extra-curricular Activity Assignment</i>		
	Section 1 – With Prompt (39 responses)	Section 2 – Without Prompt (31 responses)
Increase in understanding the value of participating in an extracurricular activity as a result of the assignment (1 = No increase, 5 = large increase)	Average: 4.2 Standard deviation: 0.8	Average: 4.0 Standard deviation: 1.1
Helpfulness of assignment in deciding whether or not to join extra-curricular activity selected by student (1 = Not helpful, 5 = Very helpful)	Average: 4.2 Standard deviation: 0.7	Average: 3.9 Standard deviation: 1.3
Time spent completing written assignment (min.)	Average: 35 Standard deviation: 11	Average: 35 Standard deviation: 18

Table 3 shows the average and standard deviation by section of students' responses to the efficacy and duration of the assignment focusing on researching a major, where only section 1 received an assignment worksheet containing a reflection prompt. Three students in section 1 and two students in section 2 did not turn in this assignment.

Table 3. Average and standard deviation by section of students' responses to the efficacy and duration of the major selection assignment.

<i>Assignment 2: Major Selection Assignment</i>		
	Section 1 – Without Prompt (37 responses)	Section 2 – With Prompt (30 responses)
Increase in understanding of potential major as a result of the assignment (1 = No increase, 5 = large increase)	Average: 4.1 Standard deviation: 0.9	Average: 4.3 Standard deviation: 0.7
Helpfulness of assignment in deciding whether or not to pursue the major selected by student (1 = Not helpful, 5 = Very helpful)	Average: 4.2 Standard deviation: 1.0	Average: 4.1 Standard deviation: 0.8
Time spent completing written assignment (min.)	Average: 44 Standard deviation: 18	Average: 54 Standard deviation: 29

The students in the section receiving the reflection prompt – section 2 – took longer on average to complete this assignment. This is consistent with the possibility that the presence of a reflection prompt spurs students to spend more time thinking about the assignment. On average, students in section 2 reported a slightly higher increase in the understanding of their potential than the students in section 1, although this difference is not statistically significant. A very slightly lower level of helpfulness of the assignment was perceived by students in section 2, although again the difference between sections in the average perceived level of helpfulness of this major selection assignment is not significantly different. As with the first assignment, the magnitude of the standard deviation in the perceived efficacy of the assignment was smaller for the section receiving the reflection prompt. This suggests the possibility of the reflection prompt serving to focus the students on the efficacy of an assignment.

The students in section 1 received a reflection prompt in the first assignment but not the second assignment, while the students in section 2 received the reflection prompt only in the second assignment. The average response by students in section 1 to the assignment efficacy questions remained about the same across the assignments, which is consistent with the possibility that the presence of a reflection prompt in an assignment may help stimulate the persistence of reflective behavior even when the reflection prompt is absent in subsequent assignments. The average response by students in section 2 to the assignment efficacy questions showed a slight increase between the first and second assignments, which suggests that the presence of a reflective prompt in an assignment may help improve the efficacy of an assignment.

Conclusions

Quantitative measures of the effectiveness of the presence of a reflection statement in an assignment on its efficacy, duration, and persistence were investigated. Students' average response to the presence of a reflection prompt in an assignment ranged from no change in the duration of an assignment to an increase in the duration of an assignment, which is consistent with the possibility that the presence of a reflection prompt may spur students to spend more time thinking about the assignment. Students' average response to the presence of a reflection prompt in an assignment also suggests that there may be a slight increase in the efficacy of an assignment when a reflection prompt is present. The average level of efficacy of an assignment remained about the same when a reflection prompt was removed between the first assignment and the second assignment. This suggests that on the time scale of about a week, there may be persistence in the efficacy of an assignment even though the reflection prompt is absent in subsequent assignments. The average level of efficacy of an assignment increased slightly when a reflection prompt was added between the first and second assignments, which is also consistent with the notion that the presence of a reflection prompt may help increase the efficacy of an assignment. In assignments where a reflection prompt was present, the magnitude of the standard deviation in students' responses regarding perceived efficacy of an assignment was smaller when a reflection prompt was present. This suggests that the presence of a reflection prompt may serve to focus students on the efficacy of an assignment.

Bibliography

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Appendix A1

Assignment given to first section of ENGR 110 students to attend a meeting of an engineering-related extracurricular club of their choosing. This assignment contains a reflection prompt.

ENGR 110

Assignment #4: Engineering Extra-curricular Activity

Your name:

Section #

Name of club or professor's name and department:

Date, time, and location of meeting:

1a. Please summarize in two or fewer grammatically correct sentences what the club or the professor's research is about.

1b. If you attended a club meeting, please list the name of the club officer you spoke with, the officer's title, and his or her major.

2. List the first of the two open-ended questions that you asked the club officer or professor. Below it, summarize the club officer's or professor's response to your question in 3 or fewer grammatically correct sentences.

3. List the second of the two open-ended questions that you asked the club officer or professor. Below it, summarize the club officer's or professor's response to your question in 3 or fewer grammatically correct sentences.

4. What did you learn about the club or the professor's research that you did not know before? Please summarize this in three or fewer grammatically correct sentences.

5. What do you like about the club or the professor's research? (A bullet point list is acceptable.)

6. What do you dislike or what concerns you about the club or the professor's research? (A bullet point list is acceptable.)

Reflection: Please review your responses to questions 1 – 6 and see if it helps you decide whether you want to pursue this engineering extra-curricular activity.

7. This assignment increased my understanding of the value of participating in an engineering extra-curricular activity in college (circle one number below):

No increase in understanding 1 2 3 4 5 Large increase in understanding

8. This assignment was helpful in deciding whether or not to join the club or the professor's research described in questions 1 – 5 (circle one number below):

Not helpful 1 2 3 4 5 Very helpful

9. Amount of time it took you to complete this written assignment: _____ minutes

Appendix A2

Assignment given to second section of ENGR 110 students to attend a meeting of an engineering-related extracurricular club of their choosing. This assignment does not contain a reflection prompt.

ENGR 110

Assignment #4: Engineering Extra-curricular Activity

Your name:

Section #:

Name of club or professor's name and department:

Date, time, and location of meeting:

1a. Please summarize in two or fewer grammatically correct sentences what the club or the professor's research is about.

1b. If you attended a club meeting, please list the name of the club officer you spoke with, the officer's title, and his or her major.

2. List the first of the two open-ended questions that you asked the club officer or professor. Below it, summarize the club officer's or professor's response to your question in 3 or fewer grammatically correct sentences.

3. List the second of the two open-ended questions that you asked the club officer or professor. Below it, summarize the club officer's or professor's response to your question in 3 or fewer grammatically correct sentences.

4. What did you learn about the club or the professor's research that you did not know before? Please summarize this in three or fewer grammatically correct sentences.

5. What do you like about the club or the professor's research? (A bullet point list is acceptable.)

6. What do you dislike or what concerns you about the club or the professor's research? (A bullet point list is acceptable.)

7. This assignment increased my understanding of the value of participating in an engineering extra-curricular activity in college (circle one number below):

No increase in understanding 1 2 3 4 5 Large increase in understanding

8. This assignment was helpful in deciding whether or not to join the club or the professor's research described in questions 1 – 6 (circle one number below):

Not helpful 1 2 3 4 5 Very helpful

9. Amount of time it took you to complete this written assignment: _____ minutes

Appendix B1

Assignment given to first section of ENGR 110 students to interview a professor in a department in which they are considering a major. This assignment does not contain a reflection prompt.

ENGR 110

Assignment #5: Interview with Professor and Flowchart

Your name:

Section #

Professor's name and department:

Date, time, and location of interview:

1. Please summarize in two or fewer grammatically correct sentences what the professor's field of engineering is about.
2. List the first of the two open-ended questions that you asked the professor about his/her field of engineering. Below it, summarize the professor's response to your question in 3 or fewer grammatically correct sentences.
3. List the second of the two open-ended questions that you asked the professor about his/her field of engineering. Below it, summarize the professor's response to your question in 3 or fewer grammatically correct sentences.
4. What did you learn about the professor's field of engineering that you did not know before? Please summarize this in 3 or fewer grammatically correct sentences.
5. What do you like about the professor's field of engineering? (A bullet point list is acceptable.)
6. What do you dislike or what concerns you about the professor's field of engineering? (A bullet point list is acceptable.)

7. Please print out the flowchart for the major (and concentration, if applicable) you're interested in pursuing. Circle a 300 level or higher course (excluding senior project) that you're interested in taking (you may need to write in the course if it's an elective). Write your name and section number on the printout and staple it to the rest of this assignment.

8. For the 300 level or higher course you circled in question 7, please fill out the table below showing when you plan to take the prerequisites (and any prerequisites required by the prerequisites) needed to enroll in the course. The prerequisites need to be listed in a quarter when they will be offered.

Freshman Year			
Fall	Winter	Spring	Summer
Sophomore Year			
Fall	Winter	Spring	Summer
Junior Year			
Fall	Winter	Spring	Summer
Senior Year			
Fall	Winter	Spring	Summer

9. This assignment increased my understanding of the value of identifying and engaging with a variety of resources (such as professors and the Cal Poly course catalog) in researching majors (circle one number below):

No increase in understanding 1 2 3 4 5 Large increase in understanding

10. This assignment was helpful in deciding whether or not to pursue the major described in questions 1 – 8 (circle one number below):

Not helpful 1 2 3 4 5 Very helpful

11. Amount of time it took you to complete this written assignment: _____ minutes

Appendix B2

Assignment given to second section of ENGR 110 students to interview a professor in a department in which they are considering a major. This assignment contains a reflection prompt.

ENGR 110

Assignment #5: Interview with Professor and Flowchart

Your name:

Section #

Professor's name and department:

Date, time, and location of interview:

1. Please summarize in two or fewer grammatically correct sentences what the professor's field of engineering is about.
2. List the first of the two open-ended questions that you asked the professor about his/her field of engineering. Below it, summarize the professor's response to your question in 3 or fewer grammatically correct sentences.
3. List the second of the two open-ended questions that you asked the professor about his/her field of engineering. Below it, summarize the professor's response to your question in 3 or fewer grammatically correct sentences.
4. What did you learn about the professor's field of engineering that you did not know before? Please summarize this in three or fewer grammatically correct sentences.
5. What do you like about the professor's department? (A bullet point list is acceptable.)

6. What do you dislike or what concerns you about the professor's field of engineering? (A bullet point list is acceptable.)

7. Please print out the flowchart for the major (and concentration, if applicable) you're interested in pursuing. Circle a 300 level or higher course (excluding senior project) that you're interested in taking (you may need to write in the course if it's an elective). Write your name and section number on the printout and staple it to the rest of this assignment.

8. For the 300 level or higher course you circled in question 7, please fill out the table below showing when you plan to take the prerequisites (and any prerequisites required by the prerequisites) needed to enroll in the course. The prerequisites need to be listed in a quarter when they will be offered.

Freshman Year			
Fall	Winter	Spring	Summer
Sophomore Year			
Fall	Winter	Spring	Summer
Junior Year			
Fall	Winter	Spring	Summer
Senior Year			
Fall	Winter	Spring	Summer

Reflection: Please review your responses to these questions and see if it helps you decide what major you'd like to pursue.

9. This assignment increased my understanding of the value of identifying and engaging with a variety of resources (such as professors and the Cal Poly course catalog) in researching majors (circle one number below):

No increase in understanding 1 2 3 4 5 Large increase in understanding

10. This assignment was helpful in deciding whether or not to pursue the major described in questions 1 – 8 (circle one number below):

Not helpful 1 2 3 4 5 Very helpful

11. Amount of time it took you to complete this written assignment: _____ minutes