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Replicating and Extending Research on the Partial Assignment Completion Effect:

Is Sunk Cost Related to Partial Assignment Completion Strength?

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Abstract

After students acquire a skill, mastery often requires students to choose to engage in assigned academic activities (e.g., independent seat work, homework). Although students may be more likely to choose to work on partially completed assignments than new assignments, the Partial Assignment Completion (PAC) effect may not be very powerful. The current studies were designed to replicate previous research and determine if the amount of sunk effort was related to PAC effect strength. Together, these studies (1) provide the only current replication of PAC effect, (2) support previous researcher which suggest that the PAC effect is not very powerful, and (3) extend the theoretical research on PAC effects by showing that sunk effort did not influence PAC effect strength. Discussion focuses on implications for educators and directions for future theoretical research designed to identify the causal mechanism responsible for the PAC effect.

Replicating and Extending Research on the Partial Assignment Completion Effect:
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After students acquire skills, educators may assign independent seatwork or homework designed to enhance skill fluency, maintenance, and generalization (Greenwood, Delquadri, & Hall, 1984; Haring & Eaton, 1978; Ivarie, 1986). However, students' skills will not improve unless they choose to work on assigned tasks (Skinner & McCleary, 2010; Skinner, Robinson, Johns, Logan, & Belfiore, 1996). This choice behavior may be influenced by several factors, including the amount of time and/or effort required to complete the assignment (Skinner, 2002; Skinner, Wallace, & Neddenriep, 2002). Because students may be more likely to choose to work on academic assignments when those assignments require less effort (Billington, Skinner, & Cruchon, 2004; Billington, Skinner, Hutchins, & Malone, 2004; Friman & Poling, 1995; Martin, Skinner, & Neddenriep, 2001), one way to enhance the probability of students choosing to engage in assigned work is to reduce assignment demands by making assignments shorter or replacing difficult high-effort tasks with easier, known tasks. However, unless the assigned activities are superfluous (i.e., busy work that does not enhance learning or skill development), these procedures that may hinder learning as they essential involve watering down the curriculum (Cates & Skinner, 2000; Cates et al., 2003; Skinner, 2002; Skinner, 2008; Skinner, 2010; Skinner et al., 1996).

Rather than decreasing assignment demands, researchers applying the additive interspersal procedure enhanced assignment demands while still increasing the probability of students choosing to engage in higher-effort academic assignments (Billington, Skinner, & Cruchon, 2004; Billington, Skinner, Hutchins, & Malone, 2004; Cates & Skinner, 2000; Cates et al., 1999). When given the choice of two assignments, additive interspersal researchers have

found that students will choose an interspersal assignment which, relative to the control assignment, contains 20-40% more high-effort target problems plus the additional interspersed, brief problems (Cates et al., 1999; Cates & Skinner, 2000). Skinner (2002) used the discrete task completion hypothesis to explain these findings. The discrete task completion hypothesis rests on an assumed learning history; specifically, when given assignments, students' assignment completion has been reinforced. Based on the principles of contingency and contiguity, stimuli that reliably precede this reinforcement should become conditioned reinforcers. When an assignment is composed of many discrete tasks, each complete discrete task is a stimulus that reliably precedes reinforcement delivered contingent upon assignment completion. Consequently, because students often have a history of reinforcement for completing assignments, each completed discrete task often serves as a reinforcer.

Although the discrete task completion hypothesis was developed to explain additive interspersal effects, this hypothesis may have other applied implications. Specifically, if students have a history of reinforcement delivered contingent upon completing assignments or a history of punishment contingent upon not completing assignments then they should be motivated to complete unfinished or partially completed assignments (Hawthorn-Embree, Skinner, Parkhurst, O'Neil, & Conley, 2010; Hawthorn-Embree, Skinner, Parkhurst, & Conley, 2011).

While not basing their theories on learning histories, Gestalt researchers also have suggested that people may have a desire to complete interrupted or incomplete tasks (Katz, 1938; Pachauri, 1935, 1936). Researchers interrupted children while they were working on various age-appropriate tasks (e.g., coloring, pasting, and puzzles) and then allowed them to choose what to do next. In some instances, the interrupted task was the only activity present and in others there were alternative tasks. Also, children always had the option of quitting the experimental session

altogether. Participants most frequently chose to complete the interrupted task (Henle & Aull, 1953; Katz, 1938; Rickers-Ovsiankina, 1928). Others interrupted children and then gave them the option of completing the task again (starting over) versus completing another type of task. Results suggested that older children (in comparison to the younger children) are likely to choose to work on the interrupted tasks than the alternatives (MacMillan, 1969). Butterfield (1964, 1965) found evidence that students might be more likely to choose the interrupted tasks when experimenters relate task completion to skill development (Butterfield, 1964, 1965). These studies suggest that students (as opposed to young children) may be highly motivated to complete academic assignments designed to enhance skills (as opposed to puzzles).

Partial Assignment Completion Effect

Recently, researchers have extended research on choice and task interruption to academic assignments (Hawthorn-Embree et al., 2010, 2011). These studies differed from previous interruption research in several ways. First, students were working on academic assignments (math computation problems) as opposed to puzzles. The assignments were comprised of multiple discrete tasks and the students were interrupted between problems. Consequently, researchers interrupted work on the assignment, as opposed to work on a discrete task (e.g., in the middle of a specific puzzle or a particular computation problems). Also, after interruption researchers allowed students to choose to finish their assignment (not start the same assignment over from the beginning) or choose to start a new math computation assignment with equivalent problems. By matching assignments using equivalent computation problems, Hawthorn-Embree et al., (2010, 2011) controlled for variables that may have influenced previous task interruption research, including participants' interest in the competing tasks and the time and effort required to complete the competing tasks.

During the Hawthorn-Embree et al. (2011) study, seventh-grade students were interrupted after completing the first 5 computation problems on a 15-problem computation assignment. They were then given the option of completing a new 10-problem assignment sheet or finishing the final 10 problems on their initial partially completed assignment. Significantly more chose to finish their partially completed assignment. The Hawthorn-Embree et al, (2010) study was similar except that students were interrupted after 5 minutes and then asked to choose to complete their partially completed assignment or a new assignment that contained approximately 10% fewer matched problems. Significantly more students chose the new lower-effort assignment. Together, these studies provide evidence that students may be more likely to choose to work on an assignment that they have started than one they have not yet begun. The authors termed this phenomenon the partial assignment completion (PAC) effect (Hawthorn-Embree et al., 2011). However, the PAC effect does not appear to be powerful enough to cause students to choose to finish a partially-completed assignment over a new assignment that requires 10% less effort to complete than the partially complete assignment (Hawthorn-Embree et al, 2010).

Researchers investigating sunk-cost may have identified a way to strengthen the PAC effect. The sunk-cost effect, which suggests that people are motivated to complete a task in which they have previously invested effort, time, or money, has been repeatedly demonstrated in economic scenarios (Arkes & Blumer, 1985; Navarro & Fantino, 2009; Thames, 1996). Arkes and Blumer investigated the sunk-cost effect with both hypothetical scenarios and an applied situation. In both contexts, participants were more likely to participate in events in which they had invested more monetary resources (sunk more cost). Navarro and Fantino also used hypothetical and applied scenarios to demonstrate that the more time individuals had invested in a task, the more likely they were to persist with that task, as opposed to quitting that task or

pursuing an alternative task. In many instances effort and time are correlated as tasks that require more time often require more effort (Haring & Eaton, 1978; Skinner, 1998; Skinner, Skinner, & Burton, 2009).

Purpose

The purpose of the current study was to replicate and extend research on the PAC effect. As researchers found evidence that the PAC effect may not be very powerful (Hawthorn-Embree et al, 2010), the primary purpose of the current study was to investigate the relationship between sunk effort and PAC effect strength. Thus, we conducted two experiments in which we manipulated the amount of work completed on partially completed assignments to test our hypothesis that increasing the amount of effort already applied to an assignment (sunk effort) before interruption would increase the probability of students choosing to complete that assignment over a new, lower-effort assignment (Experiment I) and a new, equivalent assignment (Experiment II).

Experiment I

Methods

Participants, setting, and materials. All seventh-grade students (approximately 127) enrolled in six general-education, seventh-grade math classes at a rural middle school were given the opportunity to participate. Of those, 76 students (32 boys and 43 girls) returned signed parental consent forms. Although all 76 agreed to participate, one girl's data was excluded because she failed to follow directions. Participating students' ages ranged from 12 years to 14 years (mean age = 12.09 years). Of the 75 students whose data was included, 65 students identified their ethnicity as Caucasian, 2 identified as African American, 2 as Hispanic, 1 as

Asian, 3 as Native American, and 2 identified their ethnicity as “Other”. All procedures were run in the students’ math class as students sat in their regularly assigned seats.

Four types of worksheets were constructed for this study, two partial-completion worksheets and two matched lower-effort worksheets. All worksheets contained two-digit by two-digit multiplication problems and each problem required students to perform a carrying operation at each step. Consequently, the digits 0 and 1 were never used. Mathematics problems were used because they allow for researchers to develop equivalent problems with respect to effort and perceived effort (see Billington & Skinner, 2006; Billington, Skinner, & Cruchon, 2004; Billington, Skinner, Hutchins, & Malone, 2004). The specific math problems (two-digit by two-digit multiplication problems) were selected by the teacher who was asked to help identify problems that almost all students could complete (they had acquired the skills) but could use additional practice to enhance their fluency and maintenance. The teacher indicated that because these students frequently used calculators that few would have developed the ability to complete these tasks fluently (i.e., rapidly and with little effort, see Haring & Eaton, 1978).

Consistent with Hawthorn-Embree et al, (2010, 2011) our matched lower-effort assignment contained 9, as opposed to 10 problems. Rather than having students complete 5 of 15 partial assignment problems we provided both a larger and smaller amount of partial assignment completion by requiring students to either complete 2 of 12 and 10 of 20 problems. Thus, one partial-completion worksheet contained 12 two-digit by two-digit multiplication problems. The other partial-completion worksheet contained 20 two-digit by two-digit multiplication problems. The last 10 problems were the same on both worksheets. On each worksheet there was a printed hexagon (stop sign shape) with the words "STOP HERE" printed in the middle of the hexagon. This hexagon followed the 2nd problem on the 12- problem

partial-completion assignment and the 10th problem on the 20 problem partial-completion assignment. Thus, across both worksheets the identical 10 problems followed the hexagon.

We created our matched lower-effort worksheet by first copying the last 10 problems from a partial-completion assignment. Next, we deleted the last problem. Finally, we altered the sequence of digits in one or both of the factors on each of the 9 remaining problems. Thus, if the first problem following the hexagon on the partial-completion worksheet was $79 \times 46 = \underline{\quad}$, the matched problem on the lower-effort worksheet may have been $97 \times 64 = \underline{\quad}$. Again, students were required to carry at each step. Previous researchers using similar procedures have produced equivalent assignments (e.g., no differences in problem complete rates or accuracy levels) and students perceived them as similar with respect to difficulty and time and effort required to complete the assignments (e.g., Billington, & Skinner, 2006; Billington, Skinner, & Cruchon, 2004; Billington, Skinner, Hutchins, & Malone, 2004).

Procedures. Experimental procedures were run on the same school day during regularly scheduled 45 min. math classes. Participants for whom parental consent had been obtained were provided with a student assent form and a demographic form. The primary researcher read each of these forms aloud with the students and answered any questions. Upon completion, the assent and demographic forms were collected and students not participating were given independent mathematics seatwork assigned by their classroom teacher.

Each participant was provided with a sharpened pencil with an eraser. Half of the participants received the assignment containing 12 problems and the other half received the assignment containing 20 problems. **The worksheet each student received was based on random assignment, thus, students were randomly assigned to conditions.** Students were asked to place worksheets face down until all instructions were given and they were told to begin work.

Participants were reminded to place their name (first and last) in the space provided in the upper left hand corner of the sheet prior to completing problems. Next, the researcher read standardized instructions to the participants. Instructions were as follows:

When I say begin, you may turn over your paper and begin completing problems as accurately as you can. Please complete problems working from left to right, beginning at the top of your paper (researcher points). Please try to work each problem in order and try not to skip problems. Please continue completing problems until you see the “stop” sign on your paper (researcher demonstrates). Once you have reached the “stop” sign, please raise your hand. Are there any questions? Begin.

Students were not permitted to use calculators or multiplication tables.

As each student completed the designated number of problems on their partial-completion assignment and raised his or her hand, a researcher provided the student with a new worksheet that contained nine matched problems. Thus, each student had their original assignment that contained 10 incomplete problems and a new lower-effort assignment which containing 9 problems left to complete. Previous researchers who used similar procedures to manipulate assignment effort found that each additional equivalent problem added to an assignment influence choice (decreased the probability of them choosing that assignment) and increased the amount of effort students perceived it would require to finish the assignment (see Billington & Ditommaso, 2003; Billington & Skinner, 2006; Billington, Skinner, & Cruchon, 2004; Billington, Skinner, Hutchins, & Malone, 2004; Cates & Skinner, 2000; Cates et al., 1999). With both worksheets face up on the students desk the researchers told each student that he/she would have to finish one worksheet and that he/she could choose which worksheet to complete. Students were instructed to complete the assignment they had chosen and to turn the

other worksheet face down on their desks. The researchers recorded which type of partial-completion assignment each student had received and his/her assignment choice. The last student was given approximately 10 min to work on the sheet he had chosen and all students were told to stop and worksheets were collected before the math period ended.

Design, dependent variables, and data analysis. Our hypothesis was that significantly more students who had completed 10 problems on the partial-completion assignment would choose to finish that assignment (finish what they had started) than students who had completed only 2 problems on their partial-completion assignment. Thus, the primary independent variable was the amount of sunken effort, 10 problems completed and 2 problems completed. The primary dependent variable was which assignment each student chose to finish, the partially completed worksheet or the lower-effort matched worksheet with 10% fewer problems remaining. Chi square analysis was used to test for significant differences on choice.

Procedural integrity and inter-scorer agreement. The primary experimenter developed a protocol describing experimental procedures in sequence and used this protocol to prompt her behaviors. Procedural integrity data was collected by having a second experimenter independently observe the primary experimenter's behaviors and record whether or not the behaviors were completed consistently in sequence (e.g., read instructions as written). Procedural integrity data showed that the primary experimenter completed all behaviors in the correct sequence across all six (one for each class) administrations. Following study completion, the primary researcher recorded student choice data. A second researcher independently scored 20% of these responses. Inter-scorer agreement was 100% for assignment choice.

Results and Discussion

Table 1 displays the number of students who received each type of partial-completion assignment and the number who chose the partial-completion assignment versus the lower-effort assignment. Chi square analysis was used to test our hypothesis that significantly more students from the group who received the 20-problem assignment and completed 10 problems before being interrupted would choose to complete their partially completed assignment than those from the group who received the 12-problem assignment and completed 2 problems before being interrupted. Although a larger proportion of students from the 20-problem group chose to complete their partially completed assignment (29% versus 18%), our 1-tailed chi square analysis showed that this difference was not statistically significant, $\chi^2(1) = 2.40, p = 0.06$.

Exploratory analysis¹ was conducted to test our hypothesis that significantly more students would choose the lower-effort assignment. When chi square was conducted on choice, regardless of group (i.e., 12 problem partial-completion assignment or 20 problem partial-completion assignment) significantly more students ($58/75 = 77\%$) chose the lower-effort assignment, $\chi^2(1) = 22.41, p < 0.001$. This analysis supports previous researchers who found that a mere 10% difference in effort had a more powerful influence over assignment choice than the PAC effect (Hawthorn-Embree et al., 2010).

The primary purpose of this study was to extend the research on PAC by investigating whether the amount of effort students had invested in a partially completed assignment played a role in their assignment choice. Results indicated that there was no statistically significant difference in assignment choice between students who invested the effort required to complete 10 problems on their partial-completion assignment and those who invested the effort required to complete 2 problems on their partial-completion assignment. Although these findings do not

support previous researchers who have found that the more cost or time a person sinks into a task, the more likely he or she is to resume or continue that task (Arkes & Blumer, 1985; Navarro & Fantino, 2009; Moon, 2001; Thames, 1996), there are several reasons why it would be premature to conclude that the amount of sunk-effort does not influence PAC effect strength. This was the first study designed to investigate sunken effort, PAC, and assignment choice. Although our results were not statistically significant, they were approaching statistical significant levels ($p = .06$) and they were in the correct direction (i.e., a large proportion in the 20-problem group chose the partial-completion assignment). Finally, in the current study we required students to choose between a partially completed assignment and an assignment requiring less effort. As previous researchers have shown that relative effort can influence choice more than PAC effects (Hawthorn-Embree et al, 2010; 2011), it is possible that the unequal effort diluted or masked sunk effort effects.

Experiment II

In Experiment I our statistical analysis did not support a sunk-effort effect. However, the results were in the desired direction, approached significant levels, and the influence of sunk-effort may have been masked by the other factor we manipulated, effort. Therefore, in Experiment II we examined the sunk-effort effect while keeping the effort required to complete partial-completed assignments and the new matched alternate assignment equal.

Methods

Participants, setting, and materials. Experiment II was conducted approximately 1.5 years after Experiment I. Participants were recruited from the same teacher's classes in the same manner. Consent and assessment was obtained for 66 seventh-grade students (30 males and 36 females), whose ages ranged from 12 years to 13 years (mean age = 12.24 years). Of the 66

students whose data was included, 59 students identified their ethnicity as Caucasian, 3 identified as African American, 3 as Hispanic, and 1 identified their ethnicity as “Other”. None of the students that participated in Study I participated in Study II.

Three types of worksheets were constructed: two partial-completion worksheets and one matched equal-effort worksheet. The 12-problem and 20-problem partial-completion worksheets were constructed in the same manner as Experiment I (e.g., two-digit by two-digit problems, carrying on all steps). The last 10 problems on both worksheets were identical and were preceded by a hexagon with the words "STOP HERE" printed in the middle of the hexagon. Researchers created a new equal-effort worksheet by copying the last 10 problems on the partial-completion worksheets and altering the sequence of digits in one or both of the factors on each partial-completion worksheet, while still requiring students to complete carrying operations at each step.

Procedures. Experimental procedures used were identical to those applied during Experiment I. Data collection took place in the classroom where students typically had their mathematics instruction. Assent and demographic sheets were read aloud and completed in a group format. Half of the participants were randomly assigned to receive the assignment containing 12 problems and the other half received the assignment containing 20 problems. Partial-completion assignment sheets were passed out face down and instructions were provided to the group. As each student completed the designated number of problems on their partial-completion assignment and raised her or his hand, a researcher provided the student with a new worksheet containing ten matched problems. Thus, each student had their original partially completed assignment with 10 problems left to complete and a new, equal-effort assignment with 10 matched problems to complete. Students were then required to choose an assignment to finish.

Design, dependent variables, and data analysis. The primary research question was whether a sunk-effort effect influenced students' choice to complete the partial-completion assignment or an equal-effort assignment, rather than the lower-effort assignment in Experiment I. Specifically, the researchers were interested in whether students who completed 10 problems on the partial-completion assignment would choose to finish what they had started more frequently than students who had completed only 2 problems on the partial-completion assignment. Chi square analysis was used to test for significant differences on choice.

Procedural integrity and inter-scorer agreement. Procedural integrity data was collected by having a second experimenter independently observe the primary experimenter's behaviors and record whether or not the behaviors were completed consistently in sequence (e.g., read instructions as written). Procedural integrity data show that the primary experimenter

completed all behaviors in the correct sequence across all administrations. After we completed data collection the primary researcher recorded student choice data. Using the worksheets, a second researcher randomly selected and independently scored over 20% of these responses. Inter-scorer agreement was 100% for assignment choice.

Results and Discussion

Table 2 displays the number of students who received each partial-completion assignment and the number who chose to complete the partial-completion assignment versus the new, equal-effort assignment. Table 2 shows that 59% of those who completed 10 problems (20-problem PAC assignment) chose to finish the assignment that they started while 65% of those who completed only 2 problems chose to complete their PAC assignment. Chi square analysis showed that this difference in proportions was not statistically significant, $\chi^2(1) = 1.20, p = 0.44$. Our hypothesis was that significantly more students who completed the 10 problems would choose their partially complete assignment. Because our differences in proportions were in the opposite direction, these results clearly fail to support our sunk-effort hypothesis.

We also tested our hypothesis that significantly more students would choose the partially completed assignment. When chi square was conducted on choice, regardless of group (i.e., 12 problem partial-completion assignment or 20 problem partial-completion assignment) significantly more students ($41/66 = 62\%$) chose the partially complete assignment, $\chi^2(1) = 3.88, p < 0.05$. These results support Hawthorn-Embree et al. (2011) who found that 61% of the participants in their study chose the partially complete assignment over a new equal-effort assignment.

General Discussion

Experiments I and II were designed to replicate and extend previous research. As significantly more students chose to complete an assignment they had already begun instead of a new assignment that would require the same amount of effort to complete, results from Experiment II support the Hawthorn-Embree et al. (2011) research that established the PAC effect. Confirming Hawthorn-Embree et al, (2010), during Experiment I significantly more students chose to complete the new, lower-effort assignment instead of the assignment they had already started.

Our primary goal was to attempt to identify variables that may enhance the strength of the PAC effect. Thus, we extended previous research by evaluating whether requiring students to complete more of an assignment (sink more time and effort into an assignment) before interruption would make it more likely that they would choose to complete that assignment instead of a new assignment requiring less effort (Experiment I) or a new assignment requiring equivalent effort (Experiment II). During Experiment I, the proportion of students who chose to finish their partially completed assignment was higher and approached statistical significance ($p = .06$) for the group that completed 10 problems as opposed to 2 problems; alternatively, during Experiment II the proportion of students who chose to finish their partially completed assignment was high for the group that completed 2 problems. Combining data across both experiments shows that 42% (27/64) of the students who completed 10 problems chose the PAC assignment and 40% (31/77) of the students who completed 2 problems chose the PAC assignment. When considered separately (no significant differences) and together (almost equal proportions), Experiments I and II do not provide support for the hypothesis that the amount of effort invested in a partially completed assignment influences the strength of the PAC effect.

Limitations and Future Research

There were several threats to external validity that may limit our ability to generalize findings across students, settings, or tasks. Our participants were all seventh-grade students, from the same rural middle school, who had the same teacher. Most participants were Caucasian. Also, there are several reasons why we cannot generalize our findings to typical school settings. We used computation tasks because they allowed us to control for actual and perceived effort, difficulty, length, and interest (Billington & Ditommaso, 2003; Billington & Skinner, 2006; Billington, Skinner, & Cruchon, 2004; Cates et al., 1999; Hawthorn-Embree et al., 2011). To increase the probability that students could do the task, we used computation tasks most students had learned several years ago; however, multiplication was not a skill currently being taught. No grades or consequences were delivered contingent upon computation performance and the length of the delay was very brief. The internal validity of both experiments may have been limited by various interaction effects. For instance, the researchers' presence in the room could have caused reactivity, which interacted with experimental conditions to influence students' choice behavior.

To address these threats to validity future research is needed across students, settings, and tasks. Researchers should consider conducting similar studies where students complete typical assignments (e.g., workbook assignments with numbered items) that require students to apply recently acquired skills taught during regularly scheduled school instruction. Also, future studies should be conducted with typical contingencies associated with task completion and performance (e.g., grades). In many school situations the length of the delay between an assignment being interrupted (e.g., 2nd period math class ends) and the opportunity to choose to return to and complete the interrupted assignment is longer than we employed (e.g., homework at 4:00 PM, the next day in math class). Therefore, future researchers may want to conduct similar studies with longer interruption intervals.

Because of limitations associated with these experiments, the following applied recommendations should be interpreted cautiously until additional more contextually valid studies are conducted. Teachers may be hesitant to ask students to begin independent seatwork/homework assignments toward the end of class periods or school days because students do not have enough time to complete much of the assignment. Although the current series of experiments suggests that the PAC effect is not very powerful, Experiment II provides additional evidence (see Hawthorn-Embree et al., 2011) for the PAC effect. Also, when considering results from both Experiments I and II, we found evidence that the PAC effect is not influenced by the amount of effort or time already expended on the partially completed assignment. These results suggest that even when there is only a very brief period of time left in a class educators should have students start their assignments, as even completing very little work may influence students to choose to work on the partially complete assignment in the future (e.g., for homework). This recommendation is supported by others who suggest that having students complete just a few independent practice activities immediately after acquiring a skill may help students maintain the skill (Greenwood et al., 1984). Also, after new skills or concepts are taught, if teachers are present when students first attempt to apply those skills they can enhance learning by encouraging appropriate responding, address students questions, and provide prompts and feedback to prevent students from practicing errors (Skinner & McCleary, 2010).

Although our results support having students begin independent seatwork/homework assignments even when there is little time available, they also suggest that educators should not expect large PAC effects, no matter how much work students complete beforehand. **Therefore, until more contextually valid studies are conducted which provide and indication of stronger PAC efforts or validate procedure that may strengthen PAC effects,** educators should not rely

solely on partial assignment completion to influence students to choose to engage in assigned academic work. Rather, educators should continue to encourage students to engage in academic assignments using other procedures that do not reduce assignment demands (e.g., praise, grades, group contingencies).

Gestalt (tension system, see Katz, 1938), behavioral (learning histories, see Skinner, 2002), and industrial/organizational (sunk-cost, see Arkes & Blumer, 1985) theories provide plausible explanations for the PAC effect. As our results did not support a sunk-effort or sunk-time effect, we suggest that future researcher focus on alternative causal mechanisms that may be responsible for PAC effects. This theoretical research may have strong applied value as an understanding of the causal mechanism responsible for PAC effects may allow educators and applied researchers to strengthen PAC effects and enhance the probability that student will choose to engage in assigned academic activities (Skinner, 2002).

Footnote

¹ We refer to this analysis as exploratory analysis because we did not intend to collapse data across our two studies.

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Table 1

Number and Percentage of Students Who Received Each PAC Assignment and Students' Assignment Choice

		PAC Assignment	
		20-Problem PAC Assignment	12-Problem PAC Assignment
Assignment Choice	PAC Assignment	10 (29%)	7 (18%)
	New Lower-Effort Assignment	25 (71%)	33 (83%)

Table 2

Number and Percentage of Students Who Received Each PAC Assignment and Students' Assignment Choice

		PAC Assignment	
		20-Problem PAC Assignment	12-Problem PAC Assignment
Assignment Choice	PAC Assignment	17 (59%)	24 (65%)
	New Equal-Effort Assignment	12 (41%)	13 (35%)