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Psychological Perspectives on the Three Phases of In-Person Instruction: Preparing-to-Teach, Initial-Explanation, and Interaction

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Abstract

One-on-one tutoring has been proven to be an effective method for enhancing learning outcomes for both the tutor and the tutored student. This study aimed to investigate the efficacy of the three phases of in-person instruction: preparing-to-teach, initial-explanation, and interaction phases. The randomized controlled trial involved approximately 60 children who were assigned to either study for an in-person teaching assignment or an exam during the preparing-to-teach phase. During the initial-explanation period, tutors were required to provide basic lessons to their mentees without fielding any questions, followed by a question-and-answer session (the interaction phase). The study found that participants' learning increased during the initial-explanation and interaction phases as a result of higher-quality explanations provided by both tutors and tutees. However, the phase of preparing to teach did not contribute significantly to the participants' learning. The clarity of the tutors' explanations and the success of their students were not significantly affected by whether they received in-person training or were tested. In conclusion, the phases of explaining the material and interacting with the students were found to be important contributors to students' learning during in-person instruction.The study highlights the importance of effective communication between the tutor and the tutee in enhancing learning outcomes in one-on-one teaching settings. The findings also suggest that the act of preparing to teach may not be as crucial for learning outcomes as previously thought. These results have implications for the design and implementation of effective teaching and learning strategies in various educational settings.

Keywords*:* Learning via teaching, interaction phases, peer education, explaining expectation

Introduction

One may effectively increase their learning by teaching other pupils in person (Usman et al., 2020). Prior studies have demonstrated that face-to-face training improves student learning more than studying textbooks, explaining to oneself, and giving imaginary pupils written or recorded instructional explanations

(Hillier et al., 2019). (Kobayashi, 2019; Deslauriers et al., 2019). Scholars have claimed that there are three phases of face-to-face teaching since Bardach and Klassen's seminal work in 2020: the first explanation, the preparation for teaching, and the interaction phases. The advantages of one-on-one instruction may arise at any of these stages (Usman et al., 2020; Makransky et al., 2021). Preparing to teach is a time for students to study the material they will be covering with their classmates. During this stage, students who have no prior knowledge of the issue may function as tutors. 1 In this stage, tutors provide students with their first explanations of the course's content. The students pay attention to the tutors' explanations while giving limited responses (e.g., nodding). As a result, while there may be some input from the tutees, tutor-tutee contact is often minimal. Tutors and tutees may actively engage in conversation during the engagement phase, which usually comes after the first explanation phase. Depending on the tutees' responses and questions, the tutors may get insight into whether or not the tutees have grasped the material, prompting them to adjust their approach to teaching (e.g., by providing further explanations). The specific function of each stage in face-to-face instruction is yet unknown. The current research examines if and how the three stages aid in tutors' explanation and students' understanding. Because providing high-quality explanations requires generative and creative thinking, it is believed that explaining to others is one of the essential processes of learning through teaching (Makransky et al., 2021; Hänze et al., 2018, Tobe, 2022). The effectiveness of the tutors' explanations should be a major factor in determining how well students learn. The current research investigates whether the three stages of face-to-face instruction are beneficial to students' academic performance. While it is obvious that students must be present for face-to-face education to take place, it is less evident whether or not they gain anything from their tutors' explanations during the first phases of training (explanation and engagement). This problem is also covered in the current research.

Educating others with explanations

The knowledge-construction perspective on learning through teaching (Makransky et al., 2021; Hänze et al., 2018) argues that students are provided with or encouraged to process learning information in a constructive and generative manner via the actions of producing and giving instructional explanations. Research by Hänze et al. (2018) suggests that students can improve their own understanding of a topic by explaining it to others, so long as they engage in reflective knowledge-building processes like checking in with themselves to make sure they still understand the material, comparing and contrasting what they've learned with what they already know, and drawing conclusions from their reasoning. The generative learning hypothesis proposed by Makransky et al. (2021) proposes that generative processing is the foundation of learning's efficacy through offering explanations. Selecting information from the learning material that is relevant and significant for explanations, structuring the chosen details in a logical and intelligible way, and integrating the new information with past knowledge via elaboration all constitute generative processing. Good explanations are the result of creative processing, which aids in understanding and retention. There is evidence, in favor of the knowledge-construction paradigm, that the quality of explanations may account for at least some of the success of learning via instruction (Deslauriers et al., 2019). For example, Fiorella (2021) found that teachers learned as much as their students by providing frequent, in-depth explanations to their mentees. According to research by Lachner et al. (2021), students who offered more detailed explanations on video and in written form performed better on transfer.

The way in which explanations are provided may vary between face-to-face and non-face-to-face instruction. Teaching someone face-to-face, as opposed to via the internet or over the phone, involves exchanging information and ideas with the student in the form of questions and answers and feedback. The relationship between the tutor and tutee may impact how well the tutor explains things. Deslauriers et al. (2019) and Fiorella (2021) discovered that during face-to-face education, tutees' probing inquiries prompted tutors to provide knowledge-enhancing answers. In addition, tutors often anticipate engaging in pedagogical interaction with tutees even before face-to-face instruction (Owens et al., 2020). The quality of the tutor's explanations during the initial-explanation and engagement stages may be enhanced if they anticipate offering face-to-face instruction throughout the getting-ready-to-teach phase. Examining whether the three stages of face-to-face instruction have an effect on the quality of instructors' explanations is the primary objective of the current

research.The research has yet been conducted to disentangle the impacts of tutor explanations during the initial-explanation and interaction stages, it is possible that they contribute to tutor learning in various ways. According to prior research, tutors may learn successfully by explaining things to tutees even when they are not really there (Rapanta et al., 2020; Hoogerheide et al., 2019a; Hoogerheide et al., 2019b). It's possible that the presentation of explanations during the first explanation phase is part of what makes face-to-face instruction so effective for learning. If, as was said, tutor-tutee contact is crucial to the development of explanations, then the explanations offered to students throughout the interaction phase of tutoring may have distinct consequences on their learning. The second purpose of this research is to examine how teachers' explanations influence their students' understanding throughout the first and second stages of instruction.

Learning while getting ready to teach

Some claim that tutors gain from just getting ready to teach (Bardach& Klassen, 2020; Makransky et al., 2021). For example, Owens et al. (2020) claim that students' expectation of in-person teaching boosts their motivation to learn independently. The process of expecting face-to-face teaching itself may stimulate innovative and constructive thought, increasing the effectiveness of such education as a means of enhancing student learning, in addition to impacting the quality of explanations in the initial-explanation and interaction phases. However, the present data on the effectiveness of face-to-face teaching methods is inconsistent. Preparation for in-person instruction has been shown to improve learning (Bardach& Klassen, 2020; Owens et al., 2020; Karlinsky& Hodges, 2018; Kok et al., 2020). The variability of impact sizes was substantial, according to Kobayashi's (2019) meta-analyses, which suggests that several moderators may influence the effect of face-to-face teaching anticipation.

It's also possible that the effects of lesson preparation and delivery don't add up. In other words, it might not make a difference whether students review the learning material with or without teaching anticipation, provided that the tutors' initial stages of explanation and engagement are effective enough to compensate for the incomplete and distorted learning in the preparing-to-teach phase. The fact that only video and mixed learning contexts have had any study done on the impact of teaching anticipation on the total of learning outcomes of preparation and actual teaching is a further challenge. Student learning improved when they prepared for non-face-to-face training and not when they prepared for a test, as reported by Rapanta et al. (2020). In contrast, neither Lachner and Neuburg (2019) nor Kok et al. (2020) discovered any evidence that teaching expectation had an impact on students' learning when lessons are taught through videos. The third objective of the current research is to find out whether learning while teaching face-to-face is affected by the anticipation of face-to-face instruction.

Gaining knowledge via explanations

The advantages of face-to-face instruction extend to the tutees as well as the tutors. For example, in a meta-analytic analysis by Nickow et al. (2020), peer tutoring programs at schools had a small-to-medium positive impact on students' academic performance compared to regular classroom activities ($d = 0.39$), which was somewhat higher than the tutors' learning benefit ($d = 0.34$). According to research on teaching and learning, students who get tutoring know more about the topic than they did before (Fiorella, 2021; Deslauriers et al., 2019).

Tutors' explanations may be a plentiful and beneficial resource for students who are receiving one-on-one instruction. Evidence reveals that during tutor-tutee interactions, tutors often explain things to their students. For example, Shen et al. (2019) found that during a realistic tutoring session, the tutors' instructive explanations accounted for 54% of their total utterances. Additionally, it has been said that giving students with instructional justifications might enhance their learning provided they interpret the justifications in a productive and creative manner (Kraft et al., 2018).

The question of whether explanations from tutors aid students' learning while studying face-to-face has received little scientific attention. Fiorella (2021) discovered that the frequency with which instructors delivered knowledge-building explanations was positively connected with the learning gains of tutees, indicating that

tutees acquire more from more in-depth explanations supplied by tutors. But Fiorella didn't differentiate between the first-stage explanation and the second-stage engagement (2021). As was said before, during the initial phase of explanation, tutees are only passive listeners who are not allowed to interrupt or ask questions of their instructors. As individuals get more invested in the material, they are better equipped to ask questions and provide feedback to their instructors. Given that tutees' learning is largely contingent on their ability to generate and construct knowledge from the explanations they receive, it stands to reason that tutees would benefit more from receiving higher-quality explanations from tutors during the interaction phase than the initial-explanation phase (Kraft et al., 2018). The current study's fourth objective is to determine if and how tutors' first explanations and interactions with students affect their learning.

Hypotheses and research questions

The preceding explanation gives rise to the following four questions for further investigation:

RQ1: Does the progression through the three stages of face-to-face instruction have an effect on the quality of the explanations provided by the tutors?

The results of earlier studies indicate that during tutor-tutee interactions, asking and responding to questions gives tutors a chance to explain things in more detail. It's also possible that tutors' expectations of face-to-face instruction drive productive and creative thinking throughout the time of planning to teach, which enhances the clarity of their explanations. Therefore, it is hypothesized that tutors would provide better explanations after examining learning material in preparation for face-to-face instruction (hypothesis 1a), and that these explanations will occur during the interaction period rather than the initial-explanation phase (hypothesis 1b).

RQ2: Is there a correlation between students' learning results and the quality of the tutors' early explanations and interactions?

Existing research indicates that even when tutors do not actively engage their tutees, students still benefit from their higher-quality explanations. Therefore, it is proposed that tutor participants' learning results would be predicted by the quality of their first explanations (hypothesis 2a). In addition, the quality of their reasoning during the interaction period is the only component that will account for their learning results, since instructors are able to expound on initial explanations and provide subsequent explanations throughout this time (hypothesis 2b).

RQ3: Does the likelihood of face-to-face instruction enhancing learning?

The existing research is conflicting when it comes to the learning benefits of face-to-face instruction. No particular theory is put out as a result.

RQ4: Does the quality of tutors' early explanations and interactions with students affect how well they explain things to them?

To learn from explanations, one must engage in generative and constructive processing, and it has been hypothesized that the quality of a tutor's explanations has a positive correlation with the success of their students. Students may be better able to creatively and fruitfully comprehend instructors' explanations during the interaction phase, as opposed to the initial-explanation phase. The quality of tutors' explanations during the interaction phase (but not during the initial explanation phase; hypothesis 3a) is thought to explain learning outcomes (hypothesis 3b). These research issues will be addressed by the current investigation. Before engaging in one-on-one peer tutoring, tutors familiarize themselves with the topic in anticipation of teaching or responding to inquiries from tutees in person (the "teaching expectancy condition") (the expected test result condition). The tutor participants then go through with their partners the information included in the study material without asking or responding to any questions (the first explanation phase), which is then followed by a question and response session) (the interaction phase). The learning results of the tutor and tutee participants are then evaluated using a posttest.

MethodParticipants and Design

This research included 60 undergraduate students at a national institution in Asia (37 of them were female; average age = 18.84 years; SD =.50). They were given additional course credit for participating, despite being natural speakers. None of them said that they had previous understanding of the subject of learning materials for tutors or that they had majored in psychology. Each pair of respondents was randomly assigned a tutor and a tutee, and individuals of the same gender were paired together. As an added measure, 30 tutors were split evenly between two conditions: the teaching expectation condition (n = 15) and the test expectancy condition (n = 15). Participants in the tutee role were exposed to explanations from tutors in either the teaching expectancy (n = 15) or the test expectancy (n = 15) condition.One couple failed to finish the test, hence it was not included in the analysis.

Learning Resources

Learning Resources for Tutors

As part of their lessons, instructors read aloud from a 953-character article that examined the impact of social loafing and coordination loss on team output. The text's subject was selected to pique participants' curiosity and spur them on to learn, while minimizing the likelihood that they already knew anything about it. The Appendix contains a copy of this material in English. The book provided an overview of the Rajaguru et al. (2020) approach and defined social loafing and coordination loss. The term "social loafing" refers to the trend of people being less committed to a collaborative project than they would be to completing it alone. As a result of flaws in the group process, such as misunderstandings or miscommunication, the team suffers from a condition known as coordination loss. Students yelled as loudly as they could alone, in real groups of two and six, and in pretend groups of two and six in Rajaguru et al. (2020) .'s experiment. They yelled alone while seeming to be in groups of two or six when they were really acting alone in the pseudo-groups. In the real groups.People thought that both social loafing and coordination loss would happen in the pseudo-groups, but only social loafing happened. Both the fake two-member and six-member groups and the real two-member and six-member groups, the average voice level per member was 81%, 73%, 67%, and 37% of solo yelling, respectively. The assumptions made by Rajaguru et al. (2020) and their findings on social loafing and coordination loss were not clearly discussed in the article.

Learning resources for tutees

A short text about cognitive dissonance consisting of 1074 characters was prepared in order to provide tutees with information for their education. The ideas of social loafing and coordination loss, as well as Rajaguru et al. (2020), were not mentioned anywhere in this work.

Procedure

The preparation and tutoring sessions of the current experiment were split into two groups of two. Participants for the preparatory session (8 minutes) both tutors and tutees got the appropriate texts. Tutors in the teaching expectation condition were told they would need to convey the book's plot and themes to their partners without referring to the book or their notes. In order for their partners to appropriately respond to several questions concerning the text's contents, they were instructed to prepare for teaching. Participants in the tutee and tutor groups in the test expectation condition were made aware that they would later be asked to respond to several questions about the text's contents. For them to be able to appropriately respond to the questions, it was advised that they carefully read the material.

Participants in the tutoring session were advised to explain the contents of the text to their partners so order to guarantee that their partners could correctly reply to questions about the book's contents after the 15-minute session. In addition, they were told to explain the material in detail to their partners before engaging in a detailed discussion about it (with no questions asked or answered by either partner). Participants in the tutoring were not permitted to consult the book or their notes while they were taking them. The tutee participants were told that they would have to respond to certain questions concerning the text's contents after their partners had

finished explaining them. And they were told to wait for their partners to complete explaining things before they added anything to the conversation. Participants who are the tutor and tutee may utilize a whiteboard to demonstrate and discuss their concepts with one another. All students completed a posttest immediately following the tutoring session.

Outcome metrics

The posttest was comprised of three different tests: one for conceptual understanding, one for inference, and one for transfer.

Exam of one's conceptual understanding

In order to determine how well the English-speaking participants understood social loafing and coordination loss, eight questions were used. Two of the eight items discussed instances of social loafing, such as when "Members of a ground crew examined the aircraft under the idea that other members' efforts would cover their shortcomings," the significant fault in the plane was undetected. The sentences "The hurriedly assembled soccer team could not play in close collaboration and, as a result, lost the soccer game by a large margin" and "Cases of coordination loss" were detailed in two of the items. In the previous four sections, we looked at several types of interruptions. Participants had to make snap judgements about which of three categories (coordination loss, social loafing, or others) each item represented, without knowing how many questions reflected social loafing or coordination loss. The range of possible scores is 0-8, with a Cronbach's alpha of.64 indicating high reliability.

Inference test

They were given a set of eight item short-answer questions to complete so that it could be determined whether or not the participants accurately comprehended and evaluated the findings of the experiment that was carried out by Rajaguru et al. (2020) in terms of social loafing and coordination loss. They were given the questions in order to determine whether or not the participants accurately comprehended and evaluated the findings of the experiment. The purpose of this was to determine whether or not the participants had an accurate understanding of the results of the experiment. The questions investigated the factors that contributed to the differences in the average voice volume that were observed across the various experimental conditions. These conditions included the solo condition and the two-member actual-group (social loafing and coordination loss), as well as the six-member pseudo-group and the six-member actual-group (coordination loss). Additionally, the questions investigated the factors that contributed to the differences in the average voice volume that were observed across the various experimental conditions (social loafing).The scores may have been between 0 and 8 (α=.86).

Transfer test

A fictitious experiment was conducted, and the following findings were provided that, although superficially different from Rajaguru et al. (2020) experiment, were similar structurally: Children were asked to pull a rope alone, in groups of four, and alone while thinking they were pulling in groups of four as part of an experiment by a researcher. Children tugged the rope with an average pulling power of 50 kg while acting individual, 24 kg when acting in groups, and 43 kg when acting as if they were acting in groups. Two open-ended questions were posed to participants, one asking why the pulling force was less (a) Compared to when they tugged the rope alone, the kids performed better in groups of four, and the other asking why the force was less (b) when the participants pulled the rope alone but pretended to be pulling in groups of four. They also responded to two problem-solving questions about the proportions of (c) social loafing and (d) the reduction in the group's performance may be attributed to a lack of coordination. Open-ended questions (a) and (b) were worth one point each if participants accurately identified the drop in pulling force for the real group due to social loafing and lack of coordination, respectively, and for correctly identifying the pulling-force reduction for the pseudo-group as the result of social loafing. One point was awarded for each correct response to problems (c) and (d) involving problem-solving (for example, "(50 − 43) 50 ÷ 100 = 14%," "(43 − 24)÷ 50× 100 = 38%"). As

a result, the potential scores were 0 to 4 (α=.65). All of the participants' responses were graded by the author and an impartial adjudicator. The intraclass correlation (ICC) measure of interrater reliability was.98. Discussions were used to settle disagreements.

Process measures

The utterances of the instructors throughout the initial-explanation and engagement stages were divided into explanation episodes in accordance with Deslauriers et al. (2019). " A concise section of the broader explanation that focused on a single topic" was the definition of an explanation episode (Deslauriers et al., 2019). Various aspects of the experiment conducted by Rajaguru et al. (2020), including their methodology, results, and interpretations, were reviewed in light of the conceptual implications of social loafing and coordination loss. Additional categories for explanation episodes included conceptual, theoretical, and others. Definitions of abstract concepts like social sloth and coordination loss are called conceptual explanations. Theoretical justification is provided by statements that sum up the underlying assumptions of Rajaguru et al. (2020) and give an explanation of their results in terms of social loafing and coordination loss. The two categories were created with the assumption that they would each contribute differently to learning—more specifically, to the development of fundamental conceptual, logical, and transferrable knowledge. Particularly during the interaction phase, tutor participants' explanations were often incomplete, redundant, and supportive of one another. As a result, each phase's conceptual or theoretical explanations were taken as a unit and graded for correctness and elaboration.Each explanation for a combination of concepts earned a single point if it included either the social loafing or coordination loss idea. For example, " Since people's motivation is low, they, um, do not exert their skills as much when they work in a group as they do when they work alone. This is what is meant by social loafing." For example, " For instance, as you may be aware, some individuals find it necessary to lower their voices while singing in a group," was included as an additional point if the target idea was extended in at least one of the explanations using a metaphor or an illustrative example. Therefore, while acting as a group, people perform and exert themselves less effectively than when acting alone. For every set of conceptual explanations in every step, a score ranging from 0 to 4 was given using the scoring method. Participants in tutor sessions who made no conceptual justifications received a score of 0.

The following theoretical explanation sets received different grades: One point was granted whether the compilation of theoretical explanations relied on the assumption of Rajaguru et al. (2020) that social loafing and coordination loss would both occur in actual-groups or that social loafing would only occur in pseudo-groups, for example, " Students shouting in actual-group A or B was thought to be a result of social loafing and a lack of coordination." Another point was added if Rajaguru et al. (2020) assumption was clarified in at least one of the reasons by elaborating on the justification for it, for example, " It was unable to assess the effects of coordination loss since they [participants in the pseudo-groups] screamed alone." Two bonus points were given for any theoretical explanations that addressed the impact of social loafing and lack of coordination on group performance (or, conversely, the impact of social loafing on pseudo-group performance). "For these [pseudo-]groups, only the influence of social loafing was observed because there was no need for coordination." These [actual-]groups' absence of cooperation made social laziness worse. Therefore, the performance fell off much further. Each group of theoretical justifications in each step received a score between 0 and 8, with 8 being the highest. Participants in the tutoring session who made no theoretical justifications received a score of 0.

The initial-explain and engagement stages resulted in a total of 650 explanation sessions. Out of the 650 explanation episodes, 127 or around 21% of them were chosen at random and coded by a neutral judge. Cohen's κ=.89 represented interrater reliability (the degree of agreement with the writer). The remainder of the explanation episodes were coded by the author once differences were settled via discussion. The author, an impartial judge, and each set of conceptual and theoretical explanations were then rated in the stages of first explanation and engagement. Interrater reliability ranged from an ICC of.85 to.97. Discussions were used to settle disagreements.

Results

The quality of the explanations provided by the tutors

During the first stage of explanation, tutors gave an average of 1.09 conceptual explanations (SD =.59) and 1.35 theoretical explanations (SD =.1.02). During the discussion phase, they offered 1.32 (SD = 1.07) explanations on a conceptual level and 1.78 (SD = 1.36) explanations on a theoretical level. In contrast to H1a, there were no statistically significant changes between the initial-explanation and interaction phases in terms of the quality of either conceptual or theoretical explanations (M = 1.93, SD = 1.32 vs. M = 1.57, SD = 1.49), t(39) = 1.19, d= 0.27. With rs =.18 to.29, there was no statistically significant correlation between the two phases' conceptual and theoretical explanation quality.

Mean and standard deviations for tutor explanation scores are shown in Table 1 below, broken down by condition of expected difficulty. In a MANOVA on quality-of-explanation ratings, the expectation condition was included as a between-participant variable. With Box's M = 9.09 and F (11, 6502.030) =.79, we may conclude that the homogeneity hypothesis is correct. Comparing the instruction and test expectation circumstances, there was no discernible change (Pillai's trace =.07, F (5, 35) =.57, p2 =.07). As a result, hypothesis 1b cannot be proven.

Impact of three stages on the learning of tutors and tutees

Naturally, tutor responders scored better than their partners in each of the three domains: conceptual understanding (M = 6.89, SD = 1.36 vs. M = 6.14, SD = 1.76), t(39) = 3.58, p .001, d = 0.49; inference (M = 4.04, SD = 2.80 vs. M = 2.83, SD = 2.74); and transfer (M = 1.88, SD = 1.14 vs. M = 1.42. These findings imply that tutor participants may have benefited from their exposure to the tutors' learning materials, their teaching activities, or both.

Table 1. The reliability of tutor participants' explanations was measured by means (standard deviations) for each expectation condition.

	Expectancy condition		
	Teaching	Test	*d*
Initial-explanation phase			
Concept-based justifications	2.09 (1.32)	1.75 (1.29)	0.29
Theoretic justifications	2.56 (2.64)	3.06 (2.62)	−0.19
Interaction phase			
Concept-based justifications	1.46 (1.48)	1.69 (1.54)	−0.16
Theoretic justifications	2.79 (3.08)	3.48 (2.40)	−0.25

Hierarchical regression analyses were done on the participants' conceptual knowledge, inference, and transfer scores to see whether and how the three stages of face-to-face teaching affect learning for both tutors and mentees. Expectation condition (test = 0, teaching = 1; step 1), conceptual and theoretical reasons for the initial-explanation phase (step 2), and the interaction phase (step 3). The findings of the regression analysis are shown in Table 2. Expectancy condition for tutor participants did not significantly influence their learning results (R^2s .01). Step 2 had a substantial impact on the regression models for conceptual knowledge (ΔR^2 =.25, p< .01), inference (ΔR^2 =.20, p< .05), but not transfer (ΔR^2 =.05. Step 3 substantially enhanced explained variance for conceptual knowledge, inference, and transfer (ΔR^2 =.14, p <.05,.28, p <.001, and.25, p <.01, respectively). Initial conceptual explanations strongly predicted conceptual knowledge, =.37, p< .05. Theoretical explanations were a significant predictor of conceptual knowledge, inference, and transfer during the interaction phase (β=.34, p< .05; =.55, p< .001; =.49, p< .005). Expectancy condition for tutee participants could not substantially predict their learning results, R^2s .05. Step 2 substantially influenced the regression models for transfer and

conceptual knowledge (ΔR^2 =.28, p .005) but not for inference (ΔR^2 =.09). Step 3 substantially reduced extra inference variance (ΔR^2=.22, p< .01), but not transfer or conceptual knowledge (ΔR^2 =.14 or.10). Initial conceptual explanations were a significant predictor of conceptual understanding and transfer (β=.34, p.<05 and.47, p<.01, respectively). Theoretical explanations strongly predicted inference (β=.44, p< .01) and transfer (β=.33, p <.05.) in the interaction phase.

The tutor participants' explanations at both the initial-explanation and interaction phases were significant predictors of the students' final performance. The results are consistent with both H2a and H2b. The tutor participants' learning via explanation delivery was not drastically impacted by the anticipation of in-person teaching. Hypothesis 3a was confirmed, however hypothesis 3b was not, since tutor participants' explanations explained tutee participants' learning outcomes throughout the interaction phase and throughout the first explanation phase.

Further evaluations of the tutors' explanations

Neither conceptual nor theoretical explanations provided during the initial-explanation nor the interaction phases significantly predicted the learning outcomes of the tutor and tutee participants, although there was no significant difference in the overall reliability of the explanations provided by the tutor participants. Additional studies were carried out to investigate the differences between the two phases' tutor participants' explanations. There were no discernible variations in the quality of conceptual explanations between the first-stage initial-explanation and the second-stage interaction analyses. This outcome could be the consequence of conceptual explanations' impacts in the two stages not adding up or working in concert. The offering of conceptual justifications during the interaction phase may not have had much of an effect on people who had previously learnt by giving or receiving high-quality justifications during the initial-explanation phase. Comments clarifying Rajaguru et al. (2020) assumptions were given more points, whereas remarks interpreting the results in terms of social loafing and coordination loss were given less. During the initial-explanation phase, tutor participants' assumption explanations were higher in quality (M = 1.63, Mdn = 2.00) than during the interaction phase (M =.89, Mdn =.00); Wilcoxon W = 120.2, p.10, d = 0.58. Their interpretations of the results were more exact and comprehensive during the interaction phase (M = 2.22, Mdn = 4.00) than during the initial-explanation phase (M = 1.19, Mdn =.00) (Wilcoxon W = 183.0, p .05, d = 0.85).

Table 2. Learning results for tutor and tutee participants as determined by hierarchical regression analysis

Predictor Variable	Conceptual Understanding		Inference		Transfer	
	Tutor	Tutee	Tutor	Tutee	Tutor	Tutee
Step 1: preparing-to-teach phase						
Expectancy condition	−.07	.09	.15	.26	.09	−.04
R^2	.01	.01	.00	.05	.01	.00
Step 2: initial-explanation phase						
Conceptual explanations	.37*	.34*	.10	.26	.19	.47**
Theoretical explanations	.19	.13	.30	.05	−.08	.09
ΔR^2	.25**	.18*	.20*	.09	.05	.28**
Step 3: interaction phase						
Conceptual explanations	.09	.27	−.09	.12	.01	−.07
Theoretical explanations	.34*	.22	.55***	.44**	.49**	.33*
ΔR^2	.14*	.14	.28***	.22**	.25**	.10
Total R^2	.38**	.29*	.47***	.38**	.30*	.37**

Note. Note: The final models included standardized regression coefficients (βs), * p < .05. ** p < .01. *** p < .001

Discussion

The study's goal was to determine if there is a link between the three phases of in-person training and the knowledge gained by students and the clarity with which topics are explained by instructors. Contrary to predictions, this research found no discernible change in the tutor participants' explanations' quality between the initial-explanation and interaction phases. The quality of the tutor participants' explanations did not differ statistically significantly between the teaching and test expectancy conditions, indicating that their expectation of delivering in-person instruction during the preparing-to-teach phase did not significantly affect their explanation acts during the following phases. However, the supplementary analyses did show that there was a substantial discrepancy in the tutors' explanations both before and after the students had interacted with them. According to these results, tutor participants had the chance to provide more qualitatively diverse answers to their original explanations during the interaction phase.

Conceptual comprehension, inference, and transfer were all enhanced when tutor participants provided greater initial and interactive explanations in the present study. According to the knowledge-construction viewpoint, earlier study has shown a favorable correlation between students' learning results and the clarity of tutors' explanations (Lachner et al., 2021; Fiorella 2021; Deslauriers et al., 2019). The current research provides further proof that tutors who provide better explanations help students learn more effectively. Consistent with previous research, the present results show that tutors' explanations had varying impacts on their students' learning results throughout the initial-explanation and interaction stages. During the first phase of explanation, conceptual explanations were able to account for differences in students' conceptual understanding. Throughout the interaction phase, students' levels of comprehension, inference, and transfer could be predicted by how well their theoretical arguments were formulated. The influence of conceptual explanations was found, lending credence to the idea that tutors could benefit from offering explanations even in the absence of tutees, given the limited tutor-tutee interaction during the first explanation phase. The aforementioned results also imply that by giving tutors the chance to engage in more active interaction with students, the positive benefits of face-to-face instruction are strengthened. As a result, it is proposed that the initial-explanation and interaction stages both enhance face-to-face teaching's ability to facilitate learning.

The current research, however, found no indication that anticipating to teach face-to-face during the planning phase impacts student learning while doing so. This finding is consistent with the learning consequences of both pre- and post-lesson face-to-face preparation and instruction, and it builds on the findings of Lachner and Neuburg (2019) and Kok et al. (2020), who emphasized learning via videotaped instruction. It is likely that the learning benefits of face-to-face teaching may not simply add on to those of preparing to teach face-to-face, explaining the lack of impacts of face-to-face teaching expectation, given that tutors may, at least in some situations, learn by solely preparing to teach face-to-face (e.g., Owens et al., 2020; Kobayashi, 2019, Gerardo, 2022). In other words, the benefit of preparing with test expectations as opposed to studying with face-to-face instructor expectations may have been substantially greater. This might be because in the current research, tutor participants' expectations of face-to-face instruction had no effect on their learning throughout the stage of preparing to teach. There may not have been any observable variations between the teaching and test expectation scenarios as a result of the failed face-to-face teaching expectation. Unfortunately, the current research did not compare test expectation with only studying with face-to-face instruction in order to investigate the learning consequences of doing so. To test these two hypotheses, further investigation is required.

The current research also explored the question of whether and how students benefit from their tutors' explanations. Our results corroborate those of Fiorella (2021), who found strong correlations between the clarity and thoroughness of a tutor's explanations and the success of their mentees in retaining new information. These findings suggest that students benefit from face-to-face training by having instructions explained to them. Unexpectedly, however, the tutee participants profited from hearing the tutor participants' good explanations throughout both the interaction phase and the initial-explanation phase. The tutees in the present research, like

those in previous studies on learning via face-to-face teaching (e.g., Deslauriers et al., 2019), had no access to the tutors' learning materials prior to the tutoring session and relied only on the tutors' explanations of the subject matter. Even if students are not permitted to actively participate in the lectures, accurate and thorough explanations of the material may be a helpful learning tool.

Educational implications and limitations

The results of the current investigation have consequences for schooling. One impact has to do with the expectations of teachers in terms of face-to-face instruction and the delivery of justifications. The above results imply that improving the impacts of learning by teaching face-to-face goes beyond just anticipating to do so. Additionally, it seems that there is a limit to the positive impacts of explanations, even if tutors' profit from doing so during the first explanation period. The interaction stage could be essential for maximizing learning via face-to-face instruction. In a learning-by-teaching exercise, students who take on the role of the teacher should be given the chance to engage in active partner interaction and be encouraged to give explanations throughout both the initial-explanation and engagement stages. Another aspect is the significance of presenting thorough justifications. According to the current research, tutors' and tutees' learning may be influenced by the clarity of their explanations. However, certain tutor students, including tutor participants in the current research, are unable to provide high-quality explanations, likely as a result of their subpar metacognitive monitoring abilities and subject matter expertise (e.g., Fiorella 2021; Hänze et al., 2018, Tobe, 2023).In-person instruction may be more productive if tutoring students are given direction on how to design and deliver lessons.The current study's contributions, a few drawbacks should be addressed. First, the current research found that offering high-quality explanations had correlational learning effects. There is growing evidence that explaining something to someone else is a useful learning approach. It's possible that tutor participants' first explanations just reflected their own level of expertise and comprehension at that point (e.g., Rapanta et al., 2020; Lachner et al., 2021). Future study should evaluate and account for what tutors learn in the pre-teaching phase in order to disprove this hypothesis by establishing the causal relationship between tutors' explanation-giving and learning results. Second, both the tutee and tutor participants' contributions to learning were the focus of the current analysis. This does not, however, mean that students don't contribute significantly to in-person instruction (see e.g., Fiorella, 2021; Deslauriers et al., 2019). In the future, researchers should analyze the effects of tutee conduct on learning during the explanation and interaction phases of teaching. Third, during the tutoring session in the current research, tutor participants were unable to consult the course material or their notes. It is thus quite possible that they had to access the information from long-term memory in order to provide the explanations. The information that is presently available on whether and to what degree retrieval practice—the procedure of recalling what has to be explained—accounts for the positive benefits of teaching by example is fragmented and inconsistent (Lachner& Neuburg, 2019). However, it is possible that the effectiveness of learning may be influenced by the provision of instructional reasons, which can be achieved via retrieval practice, as well as through constructive and generative processing. Last but not least, the present findings are limited in their applicability due to the study's sample population (undergraduates) and the text utilized for instruction (a book on the consequences of social loafing and coordination loss). Future studies should repeat the current research with more varied learning materials and sample sizes.

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