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Face-to-face versus computer-mediated discussion of teaching cases: Impacts on preservice teachers' engagement, critical analyses, and self-efficacy

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ABSTRACT

Two frequently-used discussion protocols were investigated as part of a program to implement teaching cases in undergraduate educational psychology classes designed for preservice teachers. One protocol involved synchronous face-to-face (FTF) discussion of teaching cases, which occurred in class after students had individually completed written case analyses as homework outside of class. The other was asynchronous computer-mediated (CM) discussion taking place outside of class, simultaneous to students' completion of their written case analyses. Six class offerings of an undergraduate child development course taught by two instructors (three classes by each instructor) were randomly assigned within instructor in a quasi-experimental design to one of the three discussion conditions: FTF, CM, or no discussion of the cases across the semester. Findings indicated that both CM and FTF discussion conditions were associated with positive outcomes relative to the control condition. Both CM and FTF discussion related to higher cognitive–affective engagement with the cases than the control condition; and the CM discussion condition was associated with higher cognitive–affective engagement than FTF discussion. In contrast, FTF discussion, but not CM discussion, was associated with higher-than-control-condition case analysis ability at the end of the semester. Potential explanations for these findings and directions for future research are discussed.

1. Introduction

Teaching cases—which typically are open-ended descriptions of authentic, concrete teaching scenarios or problems encountered in teaching—have been theorized to increase student engagement in preservice teacher education classes, improve critical thinking and problem-solving regarding teaching, and increase self-efficacy for solving teaching problems (Derry & Hmelo-Silver, 2005; Lundeberg, Levin, & Harrington, 1999; Lundeberg & Scheurman, 1997; Taylor & Wittaker, 2003). However, the true effectiveness of teaching cases likely depends on how they are implemented. For example, although some theorists hold open the possibility that reading and analyzing well-designed teaching cases might be beneficial even without discussion (e.g., Shulman, 1992), most advocates see discussion as essential to their effective use (e.g., Flynn & Klein, 2001; Laframboise & Griffith, 1997; Levin, 1995, 1999; Mayo, 2004; McDade, 1995; Merseth, 1991; Smith, 2005; Sudzina, 1997). Despite the wide use of many forms of discussion as part of utilizing teaching cases, little systematic research has explored case study discussion's contributions to student critical analysis of cases and how different forms of discussion might impact associated educational processes and outcomes.

The current study was designed to fill this gap in the research on teaching case implementation as well as potentially contribute more generally to the literature on the different affordances of online computer-mediated versus face-to-face discussion. To increase the relevance and generalizability of our results to real-life teaching situations, we conducted our study in preservice educational psychology classrooms using a quasi-experimental research design. We chose for comparison two protocols for case discussion frequently used in college classrooms: (1) face-to-face (FTF)

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discussion occurring in class after students had completed each case analysis outside of class as homework and (2) computer-mediated (CM) discussion occurring outside of the classroom via threaded, asynchronous text exchanges spread out over several days as students were analyzing each case as homework. Analysis of the differences between these two commonly used discussion protocols (including differences in effort needed to communicate, presence of nonverbal communication, and timing of the discussions) suggests that different impacts might arise either because of specific features of the discussions or the synergistic effects of combinations of these features. As we discuss in following sections, our inquiry was focused on the potential effects of the two discussion protocols on three commonly-cited benefits of teaching cases and their discussion: student engagement, ability to critically analyze teaching cases, and self-efficacy for analyzing and learning from such cases.

2. Background

In virtually all arguments supporting use of case-based instruction, case discussion is seen as inherent to effective case study implementation (e.g., Flynn & Klein, 2001; Laframboise & Griffith, 1997; Levin, 1995, 1999; Mayo, 2004; McDade, 1995; Merseth, 1991, 1999; Smith, 2005; Sudzina, 1997). Furthermore, a variety of studies over many years have documented benefits more generally of small group discussion and other forms of "conversational learning" (see Laurillard, 1999) on student comprehension, learning, motivation, retention, and attitudes (e.g., Applebee, Langer, Nystrand, & Gamoran, 2003; Chiu & Khoo, 2003; Good, Mulryan, & McCaslin, 1992; McKeachie, 1984, 1990; Slavin, 1990). A commonly-noted drawback of traditional face-to-face discussions, however, is that they require participants' physical and temporal proximity and, if the discussions are conducted during class, they significantly reduce instructional time available for other purposes. Recent years have thus seen a rapid growth of use of online, computer-mediated discussion in both on-campus and distance education (Durrington, Berryhill, & Swafford, 2006). Online discussions can span space and time and, by allowing instructors to move student discussions outside of class time, free up face-to-face instruction for other purposes. However, while considerable research exists documenting the benefits of student discussion generally, relatively little experimental research has compared online discussions with more traditional face-to-face classroom discussions of teaching cases.

Shulman (1999) has argued that different forms of discussion structures and implementation can differentially impact important educational outcomes. Such differences in structure and implementation are apparent when comparing FTF and CM discussion as they are typically used in educational contexts. FTF discussion of cases, for instance, typically will occur during class in order to accommodate student schedules and allow instructors to guide discussion as it unfolds. Perhaps because student discussions have been found to be more effective if students prepare beforehand (e.g., Flynn & Klein, 2001), FTF case discussions often are undertaken after students spend time individually analyzing a case. In addition, FTF discussion naturally uses spoken communication and is accompanied by nonverbal cues (e.g., facial expression, tone of voice). CM discussion, in contrast, more typically is used to provide flexibility for students and almost always occurs outside of class. It usually requires the more effortful production of typed text, is not accompanied by nonverbal cues, and is asynchronous, involving greater lag times between responses (e.g., Black, Levin, Mehan, & Quinn, 1983; Bordia, 1997; De Bruyn, 2004; Ferdig & Roehler, 2003; Ruberg, Moore, & Taylor, 1996; Wade & Fauske, 2004; Warschauer, 1997; Wickersham & Dooley, 2006). Because an extended period is needed for asynchronous CM discussion, CM discussion of teaching cases commonly occurs during the same time period that students are engaged in case analysis and reflection. In this study, we were interested in the impacts of these two different treatments of teaching case discussion on both the *processes* (e.g., engagement with the cases) and *outcomes* (e.g., gains in case analysis skill and self-efficacy for analyzing cases) of teaching case analyses.

2.1. Student engagement

Because of the importance of *student engagement* to the learning process, we began by examining CM and FTF impacts on engagement quantity and quality (Fredricks, Blumenfeld, & Paris, 2004). Student engagement refers to a set of cognitive, affective, and behavioral states—usually involving commitment, involvement, participation and "motivated and strategic" interaction with materials—hypothesized to mediate between teaching and learning and to be affected by instructional practices (Guthrie et al., 2004; Hoffman & Nadelson, 2010; Linnenbrink & Pintrich, 2003). Conversational learning models (Thomas, 2002) suggest that peer discussion both requires and enhances student engagement. A number of studies (e.g., as reviewed by Levin (1999)) also specifically point to the engagement value of case discussion for enhancing student interest in, enjoyment of (affective engagement), reflection upon, and learning from (cognitive engagement) teaching cases. Little research, however, has examined the engagement value of different forms of case discussion.

Although discussion may be more engaging than no discussion, it is possible that there may be no main effect differences for our CM and FTF discussion conditions on affective and cognitive engagement. Enjoyment and valuing of each form of discussion may depend on individual student preferences and personality (Straus & McGrath, 1994; Thomas, 2002). Questionnaire studies have found that, when averaged across individuals, students do report similar levels of affective engagement with both FTF and online delivery of cases or feedback (Andrews, 2002; Smith, 2005; Smith, Malkani, & Dai, 2005). Both CM and FTF discussion might enhance cognitive engagement by requiring students to express their ideas to their peers. This pressure to articulate views to one's peers—whether via FTF or CM communication—could also stimulate behavioral engagement by motivating students to spend more time on cases and engaging with course materials in their efforts to support their views. In addition, CM and FTF discussion may have complementary benefits. CM discussion presumably gives students more time and opportunities to reflect (De Bruyn, 2004), while FTF discussion may afford more chances to follow issues through to resolution (Black et al., 1983; Bordia, 1997; Orrill, 2002). Thus, greater student engagement presumably should occur in both FTF and CM discussion of cases, compared to students not discussing cases.

2.2. Critical analyses of teaching cases

Bruning et al. (2008) have argued that ability to critically analyze cases should be an important goal for utilization of teaching cases. Critical thinking generally refers to appropriately evaluating and judging arguments and propositions based on evidence (Astleitner, 2002; Dooley & Wickersham, 2007; Ennis, 1992; Kuhn, Amsel, & O'Loughlin, 1988). We defined high quality critical analysis of teaching cases as involving applications of psychological theory, including multiple perspectives, and careful evaluation of the benefits and drawbacks of potential solutions (Facione & Facione, 1994, 1996). Presumably, one reason for case method effectiveness is that interacting with cases provides *practice* in critical thinking and applying theory to classroom analysis, which results in

enhanced individual *ability* to think critically about classroom problems (e.g., McDade, 1995).

Discussion, whether CM or FTF, has several qualities likely to facilitate student analysis of cases and improve their ability to analyze cases critically. Discussion may expose students to more viewpoints and require them to clarify and analyze their own ideas. It may also challenge students' assumptions and provide practice in critical thinking and listening (Johnson & Johnson, 1999; McDade, 1995). In support of the benefits of discussion, Levin's (1995) qualitative comparison of the effects of reading and writing about cases versus additionally discussing them FTF found that preservice and beginning teachers engaging in discussion were more likely to elaborate on their original ideas, while those who did not discuss tended simply to consolidate their original ideas (see also Flynn & Klein, 2001). Extending that research to CM discussion, Ocker and Yaverbaum (1999) used a repeated measures design to compare FTF and CM discussion effects on graduate student analyses of business case studies and found equivalent case analysis quality under each form of discussion.

Prior research also suggests that CM and FTF discussion may have different strengths and weaknesses. Jonassen and Kwon (2001), for example, compared CM and FTF discussion in the context of problem-solving activities and found that, although fewer CM messages were exchanged, they were more task-focused and better conformed to the expected problem-solving process than FTF exchanges. Guiller, Durndell, and Ross (2008) compared CM and FTF discussion of a journal article and found that FTF students were more likely to expand on prior comments and ask for affirmations of their understanding. CM students, in contrast, were more likely to take a stance and provide evidence-based justifications, leading Guiller et al. to argue for using both forms of discussion as complementary to one another.

In the present study, both the timing and features of the CM and FTF discussion seemed likely to impact student practice of critical analyses and potential gains in critical analysis ability. Because the asynchronous CM discussions took place during analysis of the practice teaching cases, they presumably would provide time for reflection on each practice case, as well as peer feedback at a time when that feedback could impact the quality of the specific case analyses the students were producing. This form of CM discussion should therefore directly improve the *quality of practice case analyses*. In contrast, because FTF discussion of the practice cases in this study occurred during class after student case analyses had been handed in for grading, case discussion could not directly increase the quality of that particular practice case.

FTF discussion may be better than CM discussion in its providing feedback that is generalizable to subsequent cases, however, and thus more likely to impact our primary dependent variable—the ability to independently analyze teaching cases at the semester's end. Among the virtues of FTF discussion is that it is more immediate, less effortful, more linear, less susceptible to hanging threads (i.e., topics that are initiated and then ignored), and allows more topics to be brought up and resolved (Bordia, 1997; Guiller et al., 2008; Orrill, 2002; Ruberg et al., 1996). Thus, compared to students in CM discussion, students involved in FTF discussion presumably would be exposed to more viewpoints and have greater opportunity to critically compare their own and others' perspectives, resulting in learning gains that would generalize to future case analyses.

2.3. Self-efficacy for analyzing and learning from cases

The last dependent variable examined in our study was self-efficacy for analyzing and learning from teaching cases. Self-efficacy—the belief that one can successfully complete tasks in a particular domain—is important because it relates to numerous beneficial instructional outcomes, including motivation to persist in the face of challenges. Self-efficacy theory (Bandura, 1977, 1997, 2001; Pajares, 2006; Zimmerman & Kitsantas, 2005) identifies four major sources of self-efficacy, two of which are especially relevant to this study: enactive mastery, in which confidence is gained by completing tasks successfully, and vicarious experiences, in which confidence is gained by seeing others succeed at tasks. In the present study, practice case analyses accompanied by instructor feedback presumably would provide enactive mastery experiences allowing students in all three conditions to both improve their practice case analyses and gain confidence in doing them. Compared to the control students, however, students in the FTF and CM discussion conditions should experience greater degrees of self-efficacy-building successes by receiving more feedback during discussion. They also presumably should gain self-efficacy vicariously, by observing how their peers analyzed the cases and comparing the ideas shared by their peers to ideas in their own analyses. Thus, in contrast to the no-discussion control condition, both the FTF and CM discussion conditions should have positive effects on a measure of student self-efficacy for analyzing and learning from cases taken at the conclusion of their experience with cases.

2.4. Statement of hypotheses

Four hypotheses were examined in this study. We first predicted that students in both the FTF and CM conditions would report higher levels of engagement with the case studies than those in the no discussion control condition. Second, we predicted that FTF, CM, and no-discussion control conditions would show different patterns across time in their *quality of practice analyses,* with CM discussion having more immediate effects on quality of practice case analyses and FTF discussion resulting in improvement later in the semester. Third, we predicted that, compared to the no-discussion control condition, both CM and FTF discussion, but especially FTF discussion, would positively affect student *critical case analysis ability*, which was measured by having students independently analyze a case that was not one of the practice cases. Finally, both the FTF and CM discussion conditions were predicted to have positive effects on student self-efficacy for analyzing and learning from cases at the end of the semester compared to a no-discussion control.

3. Method

3.1. Participants

Participants were 96 students enrolled in a sophomore-level child development course at a large state university. Eighty-seven percent of the students were females. Of these, 32%, 37%, 20% and 12% were in their first, second, third, and fourth years of college, respectively. More than 95% of the participants reported using computers for word processing, email, and/or web searches. Students reported spending an average of 8.6 h on the internet per week and moderate prior experience with instructor websites and class-related online discussion ($M = 3.49$, $SD = 1.02$, where 1 = none and 5 = extensive experience).

3.2. Course context

The context for our study was an undergraduate course in child development that is a required part of preservice teachers' preparation. The course focus is on infant and child development and how developmentally-specific cognitive, emotional, social, physical, and environmental factors affect student learning.

Instruction in the course is offered in multiple class sections (hereafter, *classes*), each taught independently by doctoral-level students who served as the primary instructors for the course. Instruction is guided by a set of common objectives and each instructor typically teaches two or three classes. In the semester of the study, six classes were taught by two instructors, each of whom taught three classes. Class sizes for the participating classes ranged from 14 to 24 students (median size = 19 students). In each class, students met for 2 h once per week for 15 weeks.

The primary text for the course was by McDevitt and Ormrod (2002). Standardized multimedia presentations specific to the course were provided for instructor use in all sections. Though instructors were kept blind to study hypotheses, weekly instructor meetings were held for the purpose of standardizing course learning experiences. In each class, the first hour of class time was spent in traditional lecture and discussion of developmental principles and topics. The second hour focused on application activities, which included case discussions for students in the FTF discussion condition and other applied activities for students in the other two conditions. Homework included required case study analyses by all students and either CM case discussion for students in the CM condition or web-based research assignments for the other two conditions.

3.3. Experimental design

Each of the six classes was randomly assigned within instructor in a quasi-experimental design to one of the three conditions: FTF, CM, or no discussion of the cases across the semester. Students in all classes received the same objectives, syllabi, readings, and analyzed the same practice teaching cases. What varied across an instructor's classes was the *discussion* of the teaching cases assigned across the semester, with discussion of the practice teaching cases taking place either FTF, in CM format, or not at all, as described in Section 3.5.

3.4. Measures and administration procedures

Approval from the university's Institutional Review Board (IRB) was granted for the research. Research participation is a standard requirement of the child development course, which could be fulfilled by taking part in this study. Students completed all measures as part of their regular course participation, but were informed that their consent was required to include their data in this research. They also were told that a decision not to participate would not affect their grade. No students declined to participate.

Questionnaires containing the specific measures described below were administered in all classes at the first class meeting (pre), approximately halfway through the semester (mid), and approximately one week before the course final exam (post). Quality ratings of student performance on the practice teaching case analyses completed across the semester were obtained from course records.

3.4.1. Student background characteristics

At the beginning of the course, students completed a brief survey of demographics (e.g., gender, year in school), technology experience, and experience with online discussions (items assessing these latter two variables were rated on a 1 = none to 5 = extensive scale). So that we could assess initial equivalence of prior knowledge between study conditions, students also completed a 50-item multiple-choice measure of child development concepts and principles that contained most of the same questions later administered to them as part of the course final exam.

3.4.2. Student engagement

Mid- and post-semester measures contained items designed to assess cognitive, affective, and behavioral engagement with the practice *cases*. We similarly assessed *course* engagement to judge the breadth of our effects, i.e., whether it was possible that enhanced engagement with the teaching cases generally enhanced engagement with the course. However, while factor analyses of both sets of the engagement items indicated that case and course *behavioral* engagement could be distinguished from *cognitive–affective* engagement, these same analyses supported a single cognitive–affective factor, not separate factors for cognitive and affective items.

Thus, we combined cognitive and affective engagement items to create cognitive–affective scales for case and class engagement. *Cognitive–affective case engagement* was assessed with four items, including two items originally intended to assess cognitive engagement ("The case studies assist/assisted me in gaining a deeper understanding of the concepts presented in class" and "The case studies make the information we learn/learned in lecture seem more relevant") and two items intended to assess affective engagement ("I find/found the case studies to be interesting" and "I believe that the case studies present/presented a realistic picture of the complexities of teaching"). *Cognitive–affective course engagement* was assessed with three items, including one cognitive item ("I believe I am learning/learned a great deal in this course") and two items intended to reflect enjoyment and valuing of course information ("I am enjoying/enjoyed the lecture part of the course" and "I believe the information that I am learning/learned in this course will be useful in my career"). For both measures, students indicated their agreement using a 6-point response scale (1 = strongly disagree to 6 = strongly agree) and items were averaged to create scales (αs = .85 and .88 for mid and final case engagement; αs = .72 and .73 for mid and final course engagement). Behavioral engagement indicators included self-reported *hours/week spent working on the practice case analyses* outside of class, and *hours/week spent reading the textbook for the course*. To provide more reliable measures of student engagement, all engagement measures were administered at mid- and post-semester. Corresponding mid- and post-engagement scores were correlated, with *r*s ranging from .47 to .89. Because we were most interested in estimating overall student engagement throughout the semester of analyzing cases and not changes in engagement over time, mid- and post-scores were averaged to create single scores for each variable (e.g., mid- and post-cognitive–affective course engagement scores were averaged to create one cognitive–affective course engagement score).

3.4.3. Quality of practice analyses

Throughout the semester, all student participants practiced critically analyzing relatively brief *practice* teaching cases, which were a subset of those used earlier by Bruning et al. (2008, see Table 1). Each case consisted of a short narrative of 75–150 words describing an educational problem relevant to elementary schools (e.g., a primary-age child colliding with and hurting another on the playground, but refusing to apologize; a gifted student withdrawing from participation in order not to stand out from his/her peers; a student often failing to complete his/her homework on time due to problems at home). Each of the cases was "theoretically specified" (Doyle & Carter, 1996) by being tied to developmental concepts and principles. Each also was accompanied by substantial scaffolding (Vygotsky, 1978) that included a beginning of the semester discussion of a four-step case analysis process (e.g., see Facione & Facione, 1996; Taylor & Wittaker, 2003) and listing the relevant concepts for each case.

The six practice case analyses assigned throughout the semester were graded for critical thinking quality based on a 5-level rubric

for these cases previously adapted from Facione and Facione (1994, 1996) utilized by Bruning et al. (2008). Higher ratings (up to 5 points) reflected greater depth of critical thinking and problem solving characterized by consideration of multiple perspectives, acknowledgment of limitations of possible solutions, application of theory, and sparing use of personal experience. Lower ratings (down to 1 point) were given for lower quality answers, and no points were assigned (and data were treated as missing) if a practice case analysis was not submitted for grading. This global scoring method allowed prompt feedback to students. To ensure uniformity of scoring and feedback to students, trained research assistants rather than instructors graded the cases throughout the semester. These graders were blind to student discussion condition. Interrater reliability of the 5-point scores, estimated based on a random sample of 20 case studies scored blind to condition by two research assistants, was $r(19) = .81$, $p < .001$.

3.4.4. Critical analysis ability

Our primary measure of ability to critically analyze a teaching case was based on students' *independent* analysis of a case study titled *My Student Matthew*, which was administered as part of the pre- and post-semester measures (see Appendix A for the full case). *My Student Matthew* was not one of the practice cases used during the semester, but was similar in length and, like the other cases, theoretically specified. The primary difference between the *My Student Matthew* case and the practice cases was that it was completed independently by all students, without peer discussion or scaffolding. In responding to *My Student Matthew*, students were instructed to work independently to "identify the problems, provide possible solutions, discuss the value of each solution by using what you know about development, and state what you would do and why."

Student responses to the *My Student Matthew* case were independently scored by trained research assistants blind to study condition using a 15-point rubric developed previously by Bruning et al. (2008) to measure critical analysis of teaching cases. This rubric, providing more detailed analysis of student responses than the 5-point rubric earlier utilized for the practice cases, was designed to comprehensively assess how well students (1) identified the primary problems and issues in the case and framed them in terms of developmental concepts and principles, (2) generated and appropriately warranted feasible solutions to the problems, and (3) utilized their analyses and solutions in warranting their final decision about how (or if) they would intervene in this situation (Facione & Facione, 1994, 1996).

All case analyses were rated after the conclusion of the semester by a single researcher who was blind to study condition and when the measures were completed (i.e., pre- or post-semester). As a check on the reliability and validity of these ratings, a second researcher independently scored a randomly selected sample of 5 pre- and 5 post-case analyses from the course (10 cases total), also blind to experimental condition and time (pre/post) of data gathering. Because the interrater reliability of total scores was high ($r = .90$), similar to that found in Bruning et al. (2008), we judged that a second rater re-scoring all cases was not required.

3.4.5. Self-efficacy for analyzing and learning from cases

Student self-efficacy for analyzing and learning from case studies was assessed as part of the post-semester survey by a three-item scale (e.g., "I am confident that I can analyze case studies on my own"). Following procedures suggested by Bandura (2006), students were asked to rate each item assessing their self-efficacy on a 100-point scale (0 = no chance, to 100 = completely certain); items then were averaged to create an overall self-efficacy score. Reliability for the 3-item scale was good ($\alpha = .89$).

3.5. Experimental conditions: FTF and CM discussion and control conditions

3.5.1. Consistencies across all three conditions

Throughout the semester, and irrespective of discussion condition, all students in the course completed written analyses of the same six practice cases (described above) on an identical schedule that corresponded to the timing which case-relevant topics were covered in student readings and class. As previously noted, these written practice case analyses then were scored to determine *quality of practice* (see Measures). Students accessed the cases online from a course management system (*Blackboard*™) and were required to complete their analyses outside of class. All students were provided with feedback that was evaluative (including a 1–5 score or grade evaluation), explanatory (explaining reasons for the grade), and corrective (e.g., provision of a correct exemplar) (Mory, 2004). Instructors uploaded exemplary models of practice case analyses to the course management system for viewing by students in all three conditions. Students in any of the three conditions could also use email or see the instructor in class or during office hours to ask questions as they arose about the practice case analysis assignments. Finally, exposure to course content was controlled across all discussion conditions by having any students not participating in FTF discussion of the teaching cases (i.e., the no-discussion control and CM-discussion students) take part in other FTF activities, and by having any students not participating in CM discussion of the teaching cases (i.e., the no-discussion control and FTF-discussion students) complete other online course-relevant assignments (see Section 3.5.5).

3.5.2. Consistencies across FTF and CM discussion conditions

Students in the FTF and CM discussion conditions discussed the practice cases, whereas those in the no discussion condition did not. In both FTF and CM discussion conditions, students took turns playing the leader role. Each student was required to play the role of discussion leader at least once during the semester. In addition, FTF and CM discussion participants were rewarded for their participation in discussion through the assignment of a small number of participation points (which were equal across discussion conditions) (Brewer & Klein, 2006). Class instructors did not participate in either the FTF or CM discussions, but did monitor that students participated according to set guidelines (e.g., each student playing the assigned leader role at least once). In addition, to provide a basis for forming either the FTF or CM discussion groups, students completed a subset of 13 items from the Observation, Assumptions, and Meaning sections of the Cornell Critical Thinking Test Level Z (CCTT; Ennis, Millman, & Tomko, 1985). As recommended by LaFramboise and Griffith (1997), discussion groups (FTF or CM) of three or four students then were formed that included individuals of varied levels of critical thinking ability (nearly all of the groups were groups of 3, with only about 10% of the groups consisting of four members).

3.5.3. FTF discussion

After completing a practice case as homework, students in classes assigned to FTF discussion conditions spent approximately 30–45 min of class time in small-group discussion of that practice case. As previously noted, our goal was not to compare specific features of FTF and CM discussion, but to compare the effects of each form of discussion when used in a manner believed to maximize its positive impacts on student ability to analyze teaching cases. The following were unique features of the FTF discussion designed to maximize its positive impact. First, unlike CM discussion, which allows students to refer back to written discussion points, FTF participants may not have a common written record to refer to. Thus, in addition to the leader role, each student in the FTF discussion

groups also played the role of note taker once during the semester and brought typewritten notes to other group members at the class period following the discussion. Second, our choice to have the students complete their practice case analyses prior to FTF discussion was consistent with Flynn and Klein's (2001) recommendations for pre-discussion preparation. Although it could be argued that small group discussions should have been conducted prior to the case analyses in order to positively impact student performance on those practice cases, we felt that the maximum benefit of discussion on our key variable (increased end-of semester critical analysis ability) would be achieved if students were required, through the assignment, to prepare to the best of their ability *before* the discussion. Preparation before discussion, we believed, would maximize the value of the in-class discussion because students would bring more ideas and more carefully thought-out perspectives to share.

3.5.4. CM discussion

Students in classes assigned to CM discussion condition participated in CM small group discussions conducted asynchronously outside of class using the threaded discussion area of the *Blackboard*™ course management system. The CM discussion group leader was instructed to post a first response to the practice case; members then responded to this initial post and each other prior to a deadline listed in their syllabus. The group leader was responsible for printing out the threaded discussion and bringing it to class to hand in on the day that written practice (homework) case analyses were due. In considering the timing of the CM discussions, we weighed whether or not CM discussion should be conducted after or during student work on assigned practice case analyses. Unlike FTF discussion, it seemed less necessary or beneficial to require students to prepare before starting the CM discussion, because they would have time to reflect, review, and research during the discussion between peer responses. In fact, a key benefit of CM discussion may be that it allows greater opportunities for reflection as well as practice articulating one's thoughts in written form (the same form as the assignment). Thus, we judged that the maximum positive effect of CM discussion would occur if it were conducted *during* student preparation of their practice case analyses, rather than after preparation of the case analyses (as was the case for the FTF discussions).

3.5.5. Control activities

Students in the two control classes completed the same cases as those in the discussion classes, handed them in on the same due dates, and received the same types of feedback and grades. In these two classes, however, students did not have FTF or CM discussions of the cases with their classmates. Instead, to control for exposure to course content, on days that some course sections had FTF discussion, students in the control or CM conditions engaged in other in-class activities (e.g., modeling types of parenting styles with observers deciding which types were being portrayed by classmates). Instead of CM discussion, control web-based activities (completed by control students and students in the FTF discussion conditions) were alternative online assignments requiring activities related to the same topics as the practice cases (e.g., searching an online database for research articles related to a specific developmental topic).

4. Results

4.1. Initial equivalence of quasi-experimental conditions

Although quasi-experimental studies situated in actual teaching contexts are undertaken in order to achieve a greater measure of ecological validity, a tradeoff is that pre-existing differences between experimental conditions may threaten internal validity. Thus, participant characteristics by experimental condition are reported in Table 1. There were no statistically significant differences in the sample among experimental conditions on any of the variables except number of years in college, $F(2, 93) = 3.73$, $MSE = .93$, $p = .03$, partial $\eta^2 = .07$, with pairwise follow-ups indicating that students in the FTF discussion condition were, on average, more advanced in their undergraduate standing than those in the control condition (respective years in college: *M*s. (*SD*s) = 2.43 (.93), 1.80 (.91)). Because is common to use a less stringent p-value when establishing the equivalence of conditions (e.g., $p < .20$) so that one does not erroneously presume equivalence when differences exists, it is worth mentioning that experimental condition was also marginally related to pre-semester critical analysis ability, $F(2, 86) = 2.91$, $MSE = 3.78$, $p = .06$, partial $\eta^2 = .06$, with pairwise follow-ups indicating that the FTF-condition students scored significantly or marginally lower that the other two groups (see Table 2).

Table 1
Sample characteristics by experimental condition in the child development course.

Variable	Control		FTF		CM	
N	25		37		34	
Gender (% male)	8		21		14	
Year in school						
% Freshman (yr 1)	48		14		41	
% Sophomore (yr 2)	28		46		32	
% Junior (yr 3)	20		24		15	
% Senior (yr 4)	4		16		12	
	M	*(SD)*	*M*	*(SD)*	*M*	*(SD)*
Experience with						
Online discussion	1.86	*(.77)*	2.03	*(1.01)*	2.13	*(1.01)*
Instructor websites	3.59	*(.96)*	3.32	*(1.06)*	3.63	*(1.01)*
Prior knowledge	29.96	*(6.23)*	30.08	*(7.34)*	30.19	*(7.81)*

Notes. Ratings of experience with online discussion and instructor websites were made on a 1 = "none" to 5 = "extensive," rating scale.

Because of the potential confounding impacts of between-condition pre-existing differences, we analyzed a full model including the covariates of year in school and pre-semester critical thinking ability and their interactions with experimental condition. However, to avoid potential Type II errors that might result in finding no effects due to the power requirements associated with the inclusion of a large number of variables in a single model, when possible we simplified the full model by first removing non-significant covariate by discussion condition interactions (starting with the interaction with the largest *p*-value, removing it, and then reexamining the resulting model), and then any nonsignificant main effects involving the covariates (again, removing the covariate with the largest *p*-value first).

4.2. Student engagement

Table 2 displays the means and standard deviations for the engagement variables by experimental condition. Initial analyses including the covariates and their interactions with discussion condition resulted in dropping both covariate by condition interactions and both main effects of covariates when predicting three of the four engagement variables. The subsequent relevant oneway ANOVA analyses indicated significant differences among the conditions for cognitive–affective engagement with the case studies, $F(2, 92) = 17.95$, $MSE = .56$, $p < .001$, partial $\eta^2 = .28$; hours spent on practice case analyses, $F(2, 91) = 9.59$, $MSE = .46$, $p < .001$, partial $\eta^2 = .17$; and hours spent reading the course textbook, $F(2, 90) = 3.73$, $MSE = .85$, $p = .03$, partial $\eta^2 = .08$.

As shown in Table 2, Bonferroni-corrected pairwise follow-ups (see rightmost three columns) indicated that, compared to the control condition, both CM and FTF conditions were associated

Table 2
Comparison of primary outcome variable means (*M*) and standard deviations (*SD*) by sample and experimental condition.

Variable	Control		FTF		CM		Pairwise effect sizes (partial η^2)		
	M	*(SD)*	*M*	*(SD)*	*M*	*(SD)*	Ctrl/FTF	Ctrl/CM	CM/FTF
Cognitive–affective engagement									
Case studies	3.74	*(.98)*	4.51	*(.74)*	4.93	*(.55)*	.17**	.38**	.10*
Course	4.71	*(.83)*	4.73	*(.75)*	5.08	*(.56)*	.00	.07	.07
Behavioral engagement									
Case studies	1.34	*(.50)*	2.11	*(.72)*	1.73	*(.73)*	.26**	.09+	.07+
Reading text	1.15	*(.53)*	1.75	*(1.15)*	1.74	*(.85)*	.09+	.14*	.00
Critical analysis ability									
Pre	7.17	*(1.99)*	6.14	*(2.11)*	7.13	*(1.68)*	.06+	.00	.06*
Post	11.48	*(1.73)*	12.36	*(1.22)*	11.80	*(1.61)*			
Adj. post	11.42		12.45		11.74		.10*	.01	.06
Self-efficacy	74.97	(15.17)	81.19	(12.53)	81.88	(13.41)	.08	.12	.00

Notes. Significant differences were based on $p < .05$ Bonferroni-corrected pairwise follow-ups to significant oneway analyses of variance or, for variables measured pre and post, oneway analyses of covariance, using the pre measure as the covariate. Adjusted post-critical analysis ability scores were computed at mean pre-critical analysis levels ($M = 6.74$).

+ $p < .0333$,
* $p < .0167$,
** $p < .0033$ (Bonferroni-adjusted *p*-values).

with greater cognitive–affective engagement with the case studies. CM discussion was also associated with significantly higher cognitive–affective engagement than FTF discussion. CM, but not FTF discussion, was also associated with reports of more time spent reading the text compared to the control condition. However, FTF condition students reported significantly greater behavioral engagement with the case studies than students in the control condition as indicated by time working on the case studies at home.

When examining the final engagement dependent variable, cognitive–affective engagement in the course, initial analyses resulted in dropping the covariate by discussion condition interactions, and the main effect of year in school. However, there was a significant and positive effect of pre-semester levels of critical case analysis abilities, $F(1, 84) = 7.33$. $MSE = .49$, $p = .008$, partial $\eta^2 = .08$, which was included in the final model as a covariate. In that final model, the impact of experimental condition was not significant $F(2, 84) = 2.28$, $MSE = .49$, $p = .11$, partial $\eta^2 = .05$.

4.3. Quality of practice analyses

The average scores for each of the six individual practice cases by experimental condition (based on all completed cases) are shown in Fig. 1. Initial analyses using the average of all six cases as the dependent variable resulted in dropping both of the covariate by experimental condition interactions, and keeping the significant covariate main effects in the final model. The resulting oneway ANCOVA analysis revealed no differences between conditions on average practice score (averaged across all six cases, *M*s = 3.52–3.59; $F(2, 81) = .05$, $p = .95$, $MSE = .27$, partial $\eta^2 = .001$).

Examination of individual cases using similar procedures resulted in finding only one significant main effect of experimental condition, and that was for practice case 3 ($F(2, 80) = 4.54$, $p = .01$, $MSE = .62$, partial $\eta^2 = .10$, not including the covariates or their interactions due to lack of significant effects, and with Bonferroni-corrected follow-ups indicating that CM students achieved higher scores on case 3 than the FTF students). All other main effects of experimental condition on individual cases were not significant (partial η^2s < .05).

As shown in Fig. 1, the quality of practice cases completed in all three conditions generally increased over time, consistent with practice effects. To examine whether FTF discussion resulted in the hypothesized greater (steeper) improvements in subsequent case analyses across time, we compared the slopes of each condition's linear effects using repeated measures analyses. Initial

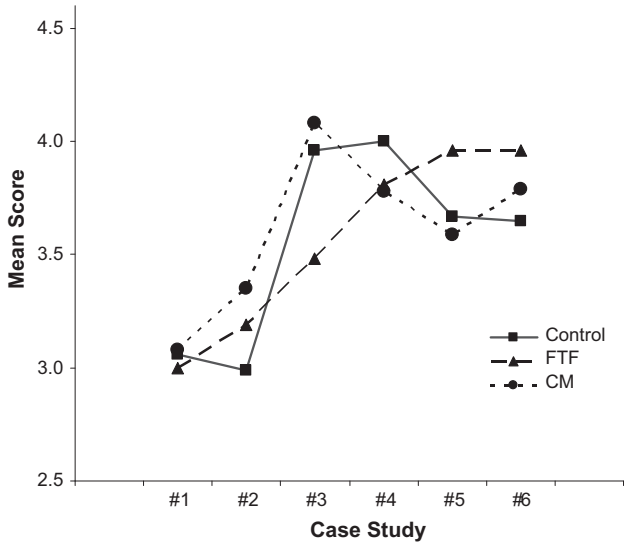

Fig. 1. Average quality of practice case analysis scores by experimental condition.

analyses including the covariates and their interactions with discussion condition and time, resulted in dropping the covariate interaction effects and the main effects. In the final model analyses, all individual slopes showed increasing linear trends ($p < .05$), with a significant condition by linear trend interaction indicating that the extent of the linear change significantly differed across experimental conditions ($F(2, 65) = 3.47$, $MSE = .51$, $p = .04$, partial $\eta^2 = .10$).[2] Follow-up pairwise repeated measures ANOVAs showed statistically significant linear slope by condition interactions indicating that the CM and FTF slopes were different ($F(1, 50) = 6.64$, $MSE = .53$, $p = .01$, partial $\eta^2 = .12$; CM slope = +.11 improvement with each subsequent case, FTF slope = +.22). However, the no-discussion control linear slope did not differ from either the FTF or CM slopes.

[2] These results were quite robust. Within-subjects analyses were conducted in several different ways, including repeated measures ANOVAs with and without replacing missing data via different methods, and also using multi-level analyses in which time points were nested within students who were then nested within classroom or by instructor. All results converged on the existence of linear trends differing significantly between conditions and also resulted in similar coefficients for the best fitting linear trends. Because the repeated measures ANOVA results are straightforward and led to the same conclusions as results from other methods, we report those results (using listwise deletion, without replacing missing data). Means plotted in Fig. 1 are based on all non-missing data for a given practice case.

4.4. Ability to critically analyze teaching cases

Table 2 shows the average pre- and post-scores for each group on ability to independently critically analyze a case. Initial analyses indicated no significant covariate by condition interactions and no significant main effect of year in school ($p > .7$), and thus these effects were not included in the final model. The final univariate analysis of the effect of discussion condition on post-semester critical analysis abilities of students while controlling for pre-semester critical analysis abilities did indicate a significant main effect of experimental condition on student post-analysis abilities, $F(2, 85) = 3.58$, $MSE = 2.19$, $p = .03$, partial $\eta^2 = .08$. In Bonferroni-corrected follow-ups, FTF group scores were significantly higher than the no-discussion control group scores, $F(1, 56) = 6.16$, $MSE = 2.07$, uncorrected $p = .016$, partial $\eta^2 = .10$, but other pairwise differences (i.e., between FTF and CM or CM and control) were not statistically significant.

4.5. Self-efficacy for analyzing and learning from cases

When examining self-efficacy for analyzing and learning from cases, initial analyses including the covariates and their interactions with discussion condition resulted in dropping the covariate by discussion condition interactions, and the main effects of both covariates. The final model analysis also revealed no main effect of experimental condition, $F(2, 89) = 2.04$, $MSE = 183.31$, $p = .14$, partial $\eta^2 = .04$.

5. Discussion

Despite the wide use of discussion as part of teaching with cases, little systematic research has explored the role of case study discussion and how different forms of discussion might impact various case-related educational processes and outcomes. The current study was designed to fill that gap in the research on teaching case implementation by focusing on two common and popular modes of discussing teaching cases, one traditional (face-to-face), and the other newer and increasingly utilized (computer-mediated). Using short, theoretically-specified cases (Doyle & Carter, 1996) as the focal point of discussion, we compared impacts of these two kinds of discussion on student engagement, learning to analyze cases, end-of-semester ability to independently analyze cases, and self-efficacy for doing so.

5.1. Primary findings

The primary findings from this study indicate that both forms of discussion—CM and FTF—had positive but different impacts on the outcome variables. CM discussion was most strongly related to cognitive–affective engagement with the cases and to self-reports of time spent reading the text. FTF discussion was most strongly related to student-reported time spent on working on the teaching cases and end-of-semester ability to critically analyze teaching cases.

5.1.1. Impacts on student engagement

Of all our findings, the strongest evidence was for the engagement value of both forms of discussion. Consistent with our first hypothesis, both the CM and FTF discussion protocols resulted in reports of greater cognitive–affective engagement with the cases compared to the control condition as well as greater behavioral engagement as indicated by at least one of the behavioral engagement variables. CM discussion also was associated with higher student cognitive–affective engagement with the cases than FTF discussion. This could imply that, if an instructor's goal is to enhance students' engagement with case studies, the inclusion of discussion as a component of case implementation—especially CM discussion—may be an effective way to accomplish this goal. Furthermore, although the quasi-experimental nature of this study does not allow us to definitively establish causation, including discussion as part of case study implementation may also result in students allotting more time to prepare their cases (as found in the FTF condition) or reading the text (as found in the CM condition).

Given that FTF and CM discussion are associated with somewhat different engagement patterns as well as different outcomes, type of engagement prompted by a discussion may affect types of outcomes achieved. For example, discussion that is more enjoyable and associated with students spending additional time reading their textbooks (perhaps to look up constructs under CM discussion) could have different impacts than discussion that encourages students to spend more time on independent case analyses (as was reported by FTF discussion students). Future research should examine processes that might explain the different engagement enhancements associated with FTF or CM discussion of cases. It would be useful to know, for instance, if students generally find case study discussions more enjoyable online or if CM discussion's longer lag times and written form offer greater opportunity for cognitive engagement. Others have noted that CM discussion does allow for repeated reflection and thoughtful, constructive replies (Hawkes & Romiszowski, 2001; Spatariu, Hartley, & Bendixen, 2004; Veerman, 2003; Wade & Fauske, 2004; Wickersham & Dooley, 2006; but see also Angeli, Valanides, & Bonk, 2003; Dooley & Wickersham, 2007). The extended time associated with asynchronous CM discussion may provide time for students to think through and resolve any cognitive dissonance aroused by teaching cases and result in an experience students perceive as engaging, enjoyable, and valuable. Alternatively, it may be that the stronger effect of CM discussion on cognitive–affective engagement with the teaching cases resulted from students having opportunities to both discuss their case analyses and revise them in light of those discussions prior to turning in the cases for a grade. It is also possible that cognitive engagement was enhanced in the CM condition because the exemplar cases were online and in the same modality as CM discussion. CM students, by being required to be online doing work related to the case analyses to a greater extent than other students, may have spent more time reviewing exemplar cases. Future research including additional process measures is needed to investigate such possibilities.

5.1.2. Impacts on student abilities to critically analyze cases

Our second hypothesis—that the FTF, CM, and no-discussion control conditions would show different patterns of increasing *quality of practice analyses* across the semester—was less strongly supported. We did find FTF discussion to be associated with the hypothesized overall steeper slope toward improvement in practice case quality than the CM discussion groups, consistent with an interpretation that more issues are resolved during FTF discussion, resulting in a learning experience that enhances future attempts to critically analyze cases. However, contrary to our predictions, CM discussion did not have an immediate impact on early practice cases, and neither the FTF nor the CM slopes were significantly different from the control condition.

In general, there were relatively high levels of variability in practice case scores. While it is certainly possible that the rise and fall of mean practice case scores observed in the CM and control groups (see Fig. 1) are a result of differences in case content, such an explanation does not account for the data from the FTF group. The FTF students showed a steadier increase in their scores, as might be expected if the cases were of similar difficulty and students were improving over time in their abilities to analyze

the cases. To understand such patterns, future research needs to examine not just the outputs of such discussions (e.g., homework scores), but also the processes taking place within the FTF and CM discussions, which were not directly assessed in the present study. The fact that CM discussion occurred as students were writing their practice case analyses might explain case-specific effects. Meanwhile, it is possible that FTF discussion, by requiring one to sit through all expressed views, may help overcome self-confirmation biases (Nickerson, 1998) to a greater extent than CM or no discussion. Future research could investigate such possibilities by including additional process-related measures in studies of such discussions.

Our third hypothesis, which involved the primary outcome of interest, was that CM and especially FTF discussion would have a positive impact on ability to independently and critically analyze teaching cases. This hypothesis was partially supported, with the FTF condition differing significantly from the control condition on end-of-semester critical analysis ability when pre-semester ability was controlled. CM condition scores, however—while lower than those of the FTF students and higher than those of control students—did not significantly differ from either.

These findings indicate that, at least for FTF discussion, discussion *does* matter. Even though all students, including those in control condition, practiced analyzing all six cases across the semester and received corrective and evaluative feedback on each of their practice attempts, there still was a clear beneficial effect of FTF discussion (compared to no discussion) consistent with prior assumptions of discussion as an important feature of case-based methods (e.g., Flynn & Klein, 2001; Laframboise & Griffith, 1997; Levin, 1995, 1999; Mayo, 2004; McDade, 1995; Merseth, 1991; Smith, 2005; Sudzina, 1997).

However, the nonsignificant differences found between the CM discussion condition and the other two conditions suggest that future research is needed to better understand the benefits and drawbacks of CM discussion. Given that discussion may be most useful when cases are less straightforward, or when certain alternative perspectives are not easily imagined on one's own, it may be useful to use more complex cases to see if the relative impacts of different forms of discussion are amplified as case difficulty increases. Alternatively, it may provide a better test of the relative strengths of CM and FTF discussion to utilize case designed to bring to light either case-specific issues (which we hypothesized concurrent CM discussion to facilitate), or more generalizable issues (which we hypothesized subsequent FTF discussion to facilitate).

5.1.3. Impacts on student self-efficacy

Our final hypothesis—that both discussion conditions would be associated with higher end-of-semester self-efficacy for analyzing and learning from teaching cases than the control no-discussion condition—was not confirmed. This finding is superficially consistent with Bruning et al.'s (2008) findings of no differences in self-efficacy for teaching between students who practiced case analyses compared to those who did not. Bruning et al.'s findings, however, could be explained by the fact their measure of self-efficacy, which focused on teaching in general, was not consonant with the practiced task. In the present study, there was a lack of such an effect even though self-efficacy was specifically assessed in relation to confidence for analyzing teaching cases. This latter finding suggests that practice and feedback, not discussion, may be primarily responsible for building self-efficacy for analyzing and learning from cases.

5.2. Limitations and directions for future research

The classroom-based quasi-experimental approach used in the present study, while having a number of advantages, also has some inherent limitations. First, prior to any experimental treatment, there were detectable beginning-of-the-semester differences among experimental conditions on some variables. Although we statistically controlled for such differences, this approach does not substitute for randomization. Given the quasi-experimental nature of our study, there also may have been other unmeasured differences between treatment groups. Future research in which participants are randomly assigned to conditions would doubtless help clarify some of present study's findings.

Second, it should be noted that the present research was conducted in classes comprised primarily of female preservice students, the majority of whom intended to become elementary teachers. We currently do not know whether CM and FTF discussion effects might vary with individual differences such as gender and vocational goals. As further case discussion research is pursued, it will be important to consider potential impacts of differences in discussion group composition.

Third, as noted previously, the present study focused primarily on discussion's outcomes. Deeper understanding of the ties between different forms of discussion and discussion outcomes will require research specifically targeting discussion-linked *processes*. Our observations of the two forms of discussion in the present study suggest that such research might include consideration of different functional benefits that could result from processes evoked by differences in *timing, structure,* and *format* of discussions. For example, because of the different *timing* of the CM and FTF discussions investigated here, CM discussion may have functioned more as a form of practice-enhancing collaboration (Johnson & Johnson, 1999), while FTF discussion may have functioned as a form of feedback (Mory, 2004) guiding independent case analysis in the future. Meanwhile, the *structure* of asynchronous CM discussion, comprised of individual topics organized into separate threads, may have allowed for reflection on topics as they pertain to students' own analyses. Thus, motivated students may be generally better able to use specific information and insights from those threaded discussions to improve their analyses of the specific cases being discussed, while less motivated students may selectively attend to or ignore certain specific discussion topics, at times leaving "hanging threads" (discussion points that are raised but then not responded to by other discussants). Finally, the verbal and expressive versus textual and less expressive *formats* of FTF and CM discussion may also be important, in that it can be more difficult to ignore a comment offered in a face-to-face format, compared to a written comment made asynchronously online (thus resulting in more hanging threads online). FTF discussion formats also allow students to share information quickly, without the need to read, write, and revise.

6. Conclusion

Our findings show that both FTF and CM discussion formats can benefit students utilizing teaching cases in preservice teacher education classes. FTF discussion, for instance, was associated with increased ability to critically analyze cases compared both to no discussion and CM discussion. Critical analysis obviously is an important outcome for case utilization and facilitating critical analysis skills presumably would be a high priority in virtually all classes in which teaching cases are used. Both CM and FTF discussion, on the other hand, were associated with increased cognitive–affective engagement with the cases, pointing to an important motivational outcome of discussing cases in either face-to-face or online settings. Our data also showed that CM discussions may be especially beneficial in this regard, resulting in cognitive–affective engagement that was not only significantly greater than that pro-

duced by simply reading and analyzing cases independently, but also higher than that in FTF discussion.

Taken together, our findings suggest that both FTF and CM discussion have positive features important for teaching case utilization. At the same time, the current study points to the need for more in-depth investigations of effects of different discussion forms in relationship to various discussion purposes. Consistent with Shulman's (1999) view that discussion's effects depend on how it is structured and implemented, we believe that research is needed to more closely tie specific benefits to different forms of case discussion and to determine optimal uses of case discussion in classes with varied gender composition, occupational goals, and levels of background preparation.

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Appendix A. My Student Matthew (pre/post measure of critical analysis ability)

Directions: Read and analyze the following case study. In your analysis identify the problems, provide possible solutions, discuss the value of each solution by using what you know about development, and state what you would do and why.

As an expert teacher, I realize that my students have unique social and educational experiences that often influence their behavior, self-esteem, and motivation in the classroom. At the beginning of each school year, I take a close look at the classroom behavior and learning styles of my new students. This year everyone seemed to be making a smooth transition from elementary to middle school with the exception of Matthew. Matthew's motivation to learn and participate in class activities was very low. It seemed as if Matthew had a sense of inferiority and a low self-esteem. I decided to schedule an early parent conference. During the parent conference, I inquired about Matthew's past academic and social experiences. The parents informed me that his 4th and 5th grade teacher often assigned tasks that were difficult for him and above his cognitive developmental stage. Because of the difficulty of the tasks, Matthew seldom experienced success. In addition, when he did complete a task, Matthew received little if any positive feedback. Since the academic goal structure of the classroom was focused on performance, Matthew's academic achievement motivation diminished. Because of his inability to win recognition through performance, Matthew didn't see the need to keep trying.

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