

Alignment in Constructivist-Oriented Teacher Education: Identifying Pre-service Teacher Characteristics and Associated Learning Outcomes

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Goals of Professional Preparation

An aim of professional preparation should be the development of an ability to reflect on and learn from practical experiences (Tynjala, 1999). The integration of theoretical and practical knowledge and the eventual ability to be a reflective practitioner are logical aims for teacher education programs. However, Mandl, Gruber, and Renkl (1996) observed that in traditional university settings, pre-service teachers normally make use of the knowledge acquired in the instructional setting but cannot generalize this to professional contexts. If abstract theoretical content studied in the university setting does not transfer to practical knowledge or future teaching practice, then theory is not influencing professional preparation.

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Nothing more than rote knowledge can be expected when methods of assessment tend to encourage students to memorize and discourage students from achieving deep understanding (e.g., Entwistle, 1995). A challenge in teacher education is to develop instructional practices that integrate theories of learning and instruction with practical pedagogical skills. This study measured the extent to which students from an

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educational psychology course learned from activities that required them to integrate theoretical information with previous practical knowledge about instruction.

This study took a situative perspective, which views learning as changes in an individual's participation in social activities as a result of the acquisition of new knowledge (Lave & Wenger, 1991; Cobb, 1994; Putnam & Borko, 2000). Putnam and Borko stated that a limitation of pre-service teachers is that they lack their own classrooms and teaching experiences that could situate the information delivered in teacher education programs. Encouraging reflection about previous classroom experiences (K-12) as students during university courses helps pre-service teachers to be innovative and critical of subsequent classroom teaching experiences, thus making up for their lack of professional experience.

A way to activate students' practical knowledge (Copeland & D'Emidio-Caston, 1998) is to engage them in discussing theories about instruction so they can argue for their understanding of such content (Richardson, 1996). The value of a theory is in its use as a tool for making sense of past and current educational experiences, and as a basis for making judgments about what constitutes effective versus ineffective instruction. Because the meaning of a theory cannot readily be understood without practical application, it should be defined and understood with reference to the contexts for which it has been produced (Saljo, 1999).

Engeström's expansive cycle (1987) asserts that the integration of theoretical and practical knowledge can occur by engaging in activities that make implicit knowledge (the filter through which people interpret, make decisions, and act in their environment) explicit, so that new theoretical information can be assimilated and accommodated into the learner's normally implicit knowledge. The outcome of this process of making the implicit explicit is that new (theoretical) information is meaningfully incorporated into the implicit knowledge used to interpret classroom experiences.

Dewey (1965) argued that if learning is to be meaningful, it must begin with what is already relevant. Dewey would support the use of qualitative evaluations such as essays that can represent students' current understanding and show individual growth. Essays were used in the current study; they engaged students in discussing theory and practice, largely in light of personal experience, at various levels of complexity. In order to implement this type of assessment, one must ask about the kinds of outcomes that are indicative of the quality of students' growth. Evaluations promoting recognition-based items inhibit enthusiastic engagement with ideas and are a barrier to the acculturation of students into reflective practitioners.

Preceding Saljo (1999) and Engeström (1987), Dewey (1965) proposed that the most appropriate pedagogy makes use of students' current knowledge and builds a conscious understanding of the domain (i.e., instruction) based on this foundation. Assessment based on recitation of facts will not be aligned with a curriculum that values quality of thinking about previous and current understandings of the content under study. Bloom's taxonomy of educational objectives was developed, and recently revised, in order to help create evaluation criteria that include and go

beyond remembering, to also account for students' understanding, application, analysis, evaluation, and creation of ideas (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956; Anderson & Krathwohl, 2002).

Alignment in Classroom Systems

Biggs' (1979) model of classroom systems is a framework that can help map out how the expansive cycle (Engeström, 1987) may take place in a university classroom (how the implicit can become explicit). Biggs' model describes three key categories of characteristics that must be aligned in order to achieve a cohesive learning environment. The first category consists of characteristics of the students, teacher, and classroom (referred to by Biggs as the student and teaching context *presage* factors). Classroom characteristics include physical, structural, and curricular components. *Process* factors are the result of the interaction between student and teaching *presage* factors and refer to the ways students approach learning. *Product* factors are the outcomes of student learning (Biggs, 1979). This study predicts that a cohesive learning environment facilitates student learning outcomes.

The present study (a) describes the classroom characteristics, (b) qualitatively measures student characteristics (students' conceptions of meaningful learning, and allocations of responsibility for learning), and (c) quantitatively measures process and product factors (formative method of assessment) (see Figure 1).

Social-Constructivist Oriented Pedagogy

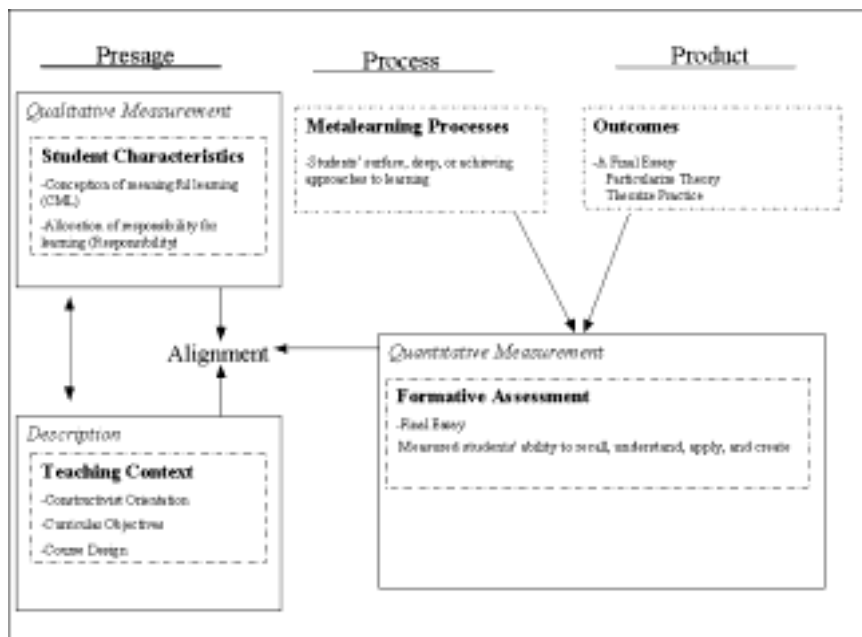
From a social-constructivist position, learning relies on social interaction and collaboration in meaning making. Course content presented through lectures should be accompanied by assignments in which learners must reflect on and use new information. In constructivist learning environments, assessment methods emphasize the learning process itself and encourage students to engage in reflective activities. Traditional exams, which are usually multiple-choice format, are unable to measure actual changes in students' knowledge (Simpson & Jackson, 2001). Conceiving of learning as conceptual change (Saljo, 1999) and writing as a constructive activity that can be used as a tool for learning and assessment (Tynjala, 1999) is consistent with a constructivist view of instruction and learning. The course described in the current study is consistent with a constructivist approach to classroom instruction (See course description in methods section), whereby the objective was an integration of theory with implicit, practical knowledge to facilitate pre-service teachers' process of acculturation to the role of teacher.

Responsibility for Learning in University

The first student characteristic of interest in the present study was pre-service teachers' allocations of responsibility for learning in university courses. Davis and Murrell (1993) reviewed the role of student responsibility in university engagement and achievement, and emphasized the importance of the relationship between

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Figure 1. An Adapted Version of Biggs' 3P Model of Classroom Systems (Biggs & Moore, 1993). Boxes with solid lines depict how presage, process, and product were measured.



institution and student. As universities are learning communities, members accepted into these communities have the privileges and responsibilities afforded to membership. Pre-service teachers and professors must acknowledge their mutual obligations for learning in order to achieve the university's ultimate goal of student growth and learning. Professors are responsible for providing opportunities for student interaction and for establishing a climate conducive to student participation. In turn, students are responsible for actively engaging in such environments. All members of the university must have a shared purpose and sense of responsibility in order to collectively engage in the learning process. Students' sense of responsibility for learning is not independent from their academic setting; institutions must therefore create learning communities that nurture student responsibility (Pace, 1984). Pace proposed that academic achievement is dependent on responsible student behavior and that university environments serve to either encourage or discourage these responsible student behaviors.

Interviews and questionnaires completed by a random sample of five professors and 30 undergraduate students from a research university in Israel found that views diverged between professors and students on who is responsible for students' failure to learn (Hativa, 2000). Although professors were satisfied with their approach to

teaching, students were critical of the professors' information transmission approach and held a preference for a more student-centered orientation. Hativa's results were consistent with Biggs' (1979) model of constructive alignment, suggesting that universities should examine their faculties' and students' perceptions of the academic environment to identify gaps between their respective perceptions. In the case of large gaps, efforts should be made to reduce them, thereby increasing alignment between student and context. A critique of Hativa's study is that the questionnaire items divided the responsibility of professor and student. There was not a question that measured a sense of shared responsibility (i.e., both student and teacher). The downfall of close-ended items is that participants can only respond in ways the researcher predicts. Such items can shape student responses and limit the participant from revealing all information that is personally relevant to what is being measured (Kuh, Pace & Vespour, 1997). Researchers could alternatively use open-ended items to relieve students from the restrictions characteristic of close-ended measurements. Using open-ended items might reveal more detailed and accurate information about students.

Students' Conceptions of Meaningful Learning

The second student characteristic of interest in this study was pre-service teachers' conceptions of meaningful learning. Biggs (1994) proposed that there are quantitative and qualitative perspectives on learning. The quantitative view refers to the conception that learning is about acquisition and growth of memorized content so that the more one knows, the more proficient a learner one is. The qualitative view refers to the conception that learning involves understanding the meaning of content by relating or connecting new material to prior knowledge.

Conceptions of learning have been linked to approaches to learning. A constructivist, or deep approach to learning, goes beyond rote memorization and is associated with a preference for instruction that encourages understanding (Marton & Saljo, 1976a; Entwistle, McCune & Walker, 2001). In contrast, students who adopt a surface approach to learning focus only on memorization (Marton & Saljo, 1976b). University students who hold restricted conceptions of learning typically adopt ineffective ways of studying, whereas students with more sophisticated conceptions of learning will be more successful (Entwistle, et al., 2001).

Dart, Burnet, Purdie, Boulton-Lewis, Campbell, and Smith (2000) used structural equation modeling to test the relationships among students' conceptions of learning, perceptions of the classroom learning environment, and approaches to learning. The authors found that students' conceptions were predictive of their approach to learning. Dart et al. suggested that teachers should facilitate students' meaningful learning by helping them develop qualitative conceptions of learning. Given that one's conceptions are predictive of their approach to learning, the same conceptions would likely also be predictive of students' learning outcomes.

In a constructivist classroom, with a method of assessment that requires

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students to integrate new information with previous knowledge, will personal conceptions of meaningful learning discriminate between students who achieve varying levels of learning outcomes? We predicted that students with conceptions of learning associated with deep approaches to learning would achieve higher scores on measures of meaningful learning than students whose conceptions were consistent with a surface level approach. It was also predicted that students with a shared sense of responsibility (between professor and students) for learning would achieve higher scores on measures of meaningful learning than those who attributed responsibility solely to the student or professor.

Method

This was a mixed method study that used a sequential exploratory strategy (Creswell, 2003). The data was necessarily collected in two phases; the initial phase, involving qualitative data collection and analysis, explored pre-service teachers' conceptions of meaningful learning and their allocation of responsibility for learning. This qualitative analysis generated categories of student characteristics. These factors were then tested for independence by a chi-square to ensure that they could be entered into an ANOVA and MANOVA as independent predictor variables. The second phase involved identifying quantitative measures of meaningful learning, based on Bloom's revised taxonomy's cognitive process dimension (Anderson & Krathwohl, 2001), which generated the four dependent variables for the MANOVA. Correlations among the dependent variables informed the study of the relationships between the categories of learning outcomes identified. The primary focus of the sequential exploratory strategy was to qualitatively examine student characteristics, then subsequently expand on the qualitative findings by integrating them into a quantitative analysis.

Participants

Twenty-six participants (16 female, 10 male) were enrolled in an educational psychology course, which was a required course for a teacher education program at a Canadian research university. Six of the pre-service teachers were in their first year of a four-year education program. Sixteen pre-service teachers were in their second year, two were in their third year, and two were in their fourth year of the program. Nineteen pre-service teachers were preparing to be secondary-level physical education teachers, five were preparing to be music teachers, one was preparing for secondary-level biology and chemistry, and one was preparing for secondary-level math and physics. The program students were enrolled in consisted of required courses, such as educational psychology, pedagogical methods courses, "teachable" content courses (e.g., courses in the Mathematics Department for students preparing to be math teachers), and a practicum where students have the opportunity to teach in a school.

Measures

Midterm questionnaire. Pre-service teachers were asked to respond in writing to the following two open-ended questions: (a) how do you define meaningful learning in the context of higher education, and (b) to whom do you attribute the major responsibility for meaningful learning as you view it in a university course?

Final essay. The essay exam challenged students to connect theories of learning to their implications for instructional practices. Specifically, students discussed (a) theories of learning, (b) the nature of conceptual and procedural knowledge, along with how to teach these kinds of knowledge, (c) the difference between conceptual and strategic knowledge and how to teach them, and (d) deliberate knowledge of the difference between effective and ineffective instruction, based on theories learned in the course. The scoring criteria were based on specific requirements set out by the professor.

Procedure

Constructivist-oriented educational psychology course. The pre-service teachers participated in a 12-week foundations course in educational psychology as a requirement for completion of a teacher education program. Organization of the course was based on the professor's social constructivist perspective; it actively engaged pre-service teachers in making meaning of the correspondence between instruction and learning. During the first week, pre-service teachers wrote an essay describing an effective and ineffective instructional context that they previously experienced as students. These were detailed accounts of their experiences and associated outcomes. Essay criteria were based on Spradley's (1979) guided tour technique to elicit detailed memories from the students. Reported memories (students' implicit knowledge of good and poor instruction) were used throughout the semester as tools for discussion and reflective activities. In the final essay, students compared their effective and ineffective experiences by relating them to theories of learning and instruction that they acquired during the course.

The professor aimed to foster a sense of shared ownership among all members of the classroom in accord with a constructivist orientation and attempted to balance the power in the classroom by encouraging students to take responsibility for teaching and learning. Requiring students to teach most of the class content to each other was intended to accomplish this goal. Students worked in pairs or triads to construct the class lessons. Student-led lectures and activities promoted understanding or application of course concepts. Each student-led lesson was followed by discussion. The instructor took on the role of facilitator by clarifying questions when needed rather than actively leading the discussions.

Measurement of students' characteristics. Pre-service teachers completed an open-ended questionnaire during class time approximately half way through the term. Their responses to the two open-ended items were analyzed by open coding

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(Strauss & Corbin, 1998) of each student's response by two raters, who then came together to calculate agreement and resolve all disagreements. The same two raters were used for all data analysis. These raters were graduate students in Educational Psychology with previous experience doing similar rating. The unit of analysis during open coding was each student's full answer to both questions.

Assessment of learning outcomes. Students were required to complete an essay at the end of the term that evaluated their ability to discuss course content. This essay required students to use this content to explain the personal experiences that they reported at the beginning of the semester.

Identification of meaningful learning sub-scores based on Bloom's revised taxonomy. Authors of the present study analyzed the scoring criteria of the final essay and classified each specific criterion deductively according to Bloom's revised taxonomy (Anderson & Krathwohl, 2001). Four measures of cognitive processes (recall, understand, apply and create) indicative of meaningful learning were identified from each student's final essay. Two raters coded the criteria and came to 84% agreement. All disagreements were discussed to come to a consensus on identification of all criteria along the dimension of the four cognitive processes.

Results

Qualitative Analyses

Students' conceptions of meaningful learning. Two superordinate categories were generated from responses to the open-ended question: "How do you define meaningful learning in the context of higher education?" The first category defined meaningful learning as knowledge being applied to new situations. This category of responses emphasized making use of knowledge in practical and work settings. Examples of students' responses are: "Information related to skills that will be useful in the future" and "learning information relevant to you in order to apply it in the future." The second superordinate category defined meaningful learning with a cognitive orientation. Two subcategories of this second category emerged; the first defined meaningful learning as relating new information to existing knowledge, schemata, or points of view. Examples of students' responses are: "Relating understood information to prior knowledge" and "teaching something to the class that students can relate to from past experiences." The second subcategory emphasized the words "understanding" and "meaning making." Examples of students' responses are: "Truly understanding, not just memorizing; participating in discussion" and "meaning making and understanding." Inter-rater reliability was 84.6%; all disagreements were resolved through conversation.

Allocation of responsibility for meaningful learning. Three categories were generated from pre-service teachers' responses to the open-ended question: "To

whom do you attribute the major responsibility for meaningful learning as you view it in a university course?" Eleven students attributed the responsibility for learning as shared between the professor and students. Eleven students attributed the responsibility for learning solely to the student, and four students attributed the responsibility for learning solely to the professor. Inter-rater reliability was 100%.

Quantitative Analyses

The second phase of data analysis involved scoring final essays quantitatively. During this phase, the qualitative results of pre-service teachers' characteristics were used in subsequent quantitative analyses as predictor variables in order to answer the research question: Do final essay scores, in total or with meaningful learning subscores identified, vary as a function of students' conceptions of and allocation of responsibility for meaningful learning? In order to answer this question, the categories were first tested for independence in order to use them as predictor variables. The predictor variables were then entered into an ANOVA to determine differences among students' overall essay scores. The essay scores were broken down by the different subcategories of learning outcomes based on Bloom's revised taxonomy as evidence of meaningful learning. These subscores were entered into a correlation analysis to measure the relationships among them, and used as the dependent variables for the MANOVA model.

Test of independence between student presage factors. Chi-square results failed to reject the null hypothesis that students' conceptions are independent of their allocation of responsibility for meaningful learning. Thus, categories of conceptions of meaningful learning, and allocation of responsibility for learning are independent, $\chi^2(2, N = 27) = 4.18, p = 0.128$. The chi-square model fit the current data well, as indicated by residual analysis testing (Stevens, 2002). Standardized residuals for the present sample varied between 1.18 and -0.99 , with a mean = 8.3^{-03} (See Table 1). A residual is the difference between the observed frequencies of students' conceptions and their allocations of responsibility and the frequencies theoretically expected, assuming the two characteristics are independent. Small residuals indicated that the observed data fit the theoretical model of independent characteristics.

2 X 3 ANOVA for final essay score. A 2 X 3 (Conception X Responsibility) ANOVA failed to reject the null hypothesis that students' final essay scores would vary as a function of students' conceptions of meaningful learning or allocation of responsibility for learning, $F(3, 24) = 1.68, p = 0.20 (f = 0.38)$. This ANOVA initially tested the total essay score, rather than including it in the MANOVA, because total score was linearly dependent on the subscores.

Correlations among dependent variables. Correlations among the dependent variables of recall, understand, apply, and create support the hierarchical structure and intended overlap between cognitive processes described in each of these

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Table 1. Percentage of Frequencies for Students' Conceptions of Meaningful Learning and Allocation of Responsibility for Meaningful Learning

Allocation of responsibility	Conception of Meaningful Learning		Total Percent
	Application	Cognitive	
Student and Professor			
Percent	25.53%	14.81%	40.74%
Row Percent	63.64%	25.00%	
Column Percent	63.64%	36.36%	
Standardized Residual	1.18	-0.99	
Student			
Percent	11.11%	29.63%	40.74%
Row Percent	27.27%	50.00%	
Column Percent	27.27%	72.73%	
Standardized Residual	-0.69	0.58	
Professor			
Percent	3.70%	14.81%	18.52%
Row Percent	9.09%	25.00%	
Column Percent	20.00%	80.00%	
Standardized Residual	-0.73	0.60	
Total Percent	40.74%	59.26%	100.00%

categories. Any given cognitive process was only significantly correlated with the process directly before and after it. Recall was significantly correlated with understand; understand was significantly correlated with apply; and apply was significantly correlated with create. No other correlations among variables were significant (See Table 2).

2 X 3 MANOVA for measures of meaningful learning. The MANOVA tested the hypothesis that measures of students' meaningful learning outcomes would vary as a function of their conception of meaningful learning and their allocation of the

Table 2. Correlations Among Scores of Meaningful Learning

Subscale	1	2	3	4
Students (n = 25)				
1. Recall	—	0.436*	0.286	0.401
2. Understand		—	0.478*	0.260
3. Apply			—	0.571*
4. Create				—

Note. * $p < .05$.

responsibility for meaningful learning. Students who had a shared sense of responsibility for learning in university courses obtained significantly higher scores on understanding and application measures, as compared to their peers who attributed responsibility solely to the student or professor. Students' scores did not vary as a function of their conception of meaningful learning.

A 2 X 3 (Conception X Responsibility) MANOVA that tested for differences among students' recall, understand, apply, and create final essay subscores yielded two significant overall MANOVAs. The general linear model procedure was used to calculate type III sums of squares to account for unequal cell sizes. Wilks' Lambda was used to test for significance at $\alpha \leq .05$. Students' allocation of responsibility for learning yielded a significant overall MANOVA, $F(4, 17) = 4.98, p < .01 (f = 0.86)$, indicating that allocation of responsibility had a significant influence on learning outcomes. A pre-planned comparison of students who attributed responsibility for learning to both the professor and students versus those who gave sole responsibility to either the student or the professor yielded an overall significant MANOVA, $F(4, 16) = 3.16, p < .05$, indicating that those who had a shared sense of responsibility understood and applied more theory than those who attributed responsibility to either the student or teacher alone (See Table 3 for the means and standard deviations of groups). There was a significant main effect of responsibility for the measure of students' understanding, $F(2, 24) = 4.03, p < .05 (f = 0.71)$. There was a significant main effect for responsibility, $F(2, 24) = 7.29, p < .01$, and based on the pre-planned comparison, there was a significant difference between those students who had a shared sense of responsibility versus those who saw responsibility as residing entirely with either the professor or student, $F(1, 24) = 11.78, p < .01$. Table 3 illustrates the least squares means and standard deviations for categories of responsibility which were calculated in order to make groups of unequal sample sizes comparable.

Table 3. Adjusted Means and Standard Deviations for Categories of Responsibility

Subscale	Least Squares Mean (Standard Deviation)		
	Student and Professor n = 11	Student n = 11	Professor n = 4
Recall	7.68 (2.21)	7.15 (1.54)	8.33 (3.78)
Understand*	5.96 (2.15)	3.28 (2.02)	5.83 (2.26)
Apply**	7.81 (1.98)	4.13 (2.51)	4.73 (1.75)
Create	4.88 (3.32)	3.95 (2.81)	2.65 (1.41)

Note. * significant main effect at $p < .05$. ** significant main effect and significant pre-planned comparison of 'Student and Professor' vs. 'Student' and 'Professor' at $p < .01$.

Discussion

A Situated Perspective on Student Presage Factors

The results of the qualitative analysis provide a useful description of pre-service teachers' conceptions and allocation of responsibility for learning in university courses. All students held a qualitative conception of meaningful learning (e.g., Biggs, 1994), which was consistent with constructivist philosophy and deep approaches to learning. However, the two categories of students' conceptions differed in orientation. That is, one group of pre-service teachers focused on meaningful learning in much the same way that Saljo (1999) discussed conceptual change as cognitive in nature, whereby new knowledge is integrated and related to existing understanding and assumptions about one's world. The second group's conceptions were reflective of Mayer's (2002) description of transfer as being indicative of meaningful learning. Students in the second group described meaningful learning as applying learned material to solve new problems, which is consistent with Mayer's description. Given that no student provided a response consistent with quantitative conceptions of learning, there was no quantitative-conception comparison group. Future studies could look at learning outcomes in similar classrooms that identify students who hold more varied conceptions of meaningful learning.

Students' conceptions of learning are to some extent influenced by the classroom context (Euklund-Myrskog, 1998; Trigwell, Prosser & Waterhouse, 1999). The qualitative conceptions reported by students could have been influenced by the fact that they were taking part in a constructivist-oriented course that was consistent with qualitative conceptions of learning. Results from the research of Trigwell et al. and Euklund-Myrskog, in addition to the current findings, support the notion that there is an interactive relationship between student and classroom characteristics proposed in Biggs' 3P (1979) model.

As for pre-service teachers' allocations of responsibility for learning in university courses, the current methods and results differed from Hativa's (2000). The majority of students acknowledged some form of responsibility for their learning and identified themselves as active members in the learning process. Allocation of responsibility for learning is therefore also believed to be influenced by classroom environments. Pre-service teachers who allocated responsibility to both the student and professor acknowledged the shared responsibility required for a successful social-constructivist and interactive course.

Constructive Alignment Within Biggs' 3P Model

This study lends unique support to Biggs' 3P model (Biggs & Moore, 1993), as the student characteristics measured here had not previously been included in studies using this model. The essay evaluation of learning outcomes is a unique way of representing Biggs' process and product factors. Consistent with the 3P model,

those pre-service teachers most in line with the classroom culture understood and applied more theory. However, students with different conceptions of meaningful learning did not show significantly different learning outcomes. Pre-service teachers that attributed responsibility for learning to the student and professor understood and applied more in their final essays, compared to students who attributed responsibility solely to the student or professor. The current study provides some evidence that pre-service teachers' attribution of responsibility for learning may be related to how they learn from courses in teacher education programs.

The Complexity of Written Products

The necessity of identifying the complexity of written products is supported by the finding that only particular levels of meaningful learning varied according to a pre-service teacher's allocation of responsibility for learning. Total essay scores did not vary according to allocations of responsibility for learning, indicating that pre-service teachers could arrive at the same total score in various ways. If evaluation aims to engage students in levels of thought beyond recall and recognition, then the levels of engagement should be explicitly identified in scoring criteria. This study supports the ecological validity of using Bloom's revised taxonomy (Anderson & Krathwohl, 2001) to evaluate essays in more complex ways than the traditionally used holistic analysis (Haag-Granello, 2001). Students demonstrate various levels of learning in written essays, thus, research measuring learning outcomes should identify these levels in order to better understand the ways in which students have been able to make sense of course content. Looking at total essay scores leaves a lot of ambiguity, as supported by the results of this study.

A closer look at the structure of the essays revealed that all pre-service teachers scored similarly on the recall and create categories of learning outcomes, which explains the lack of significant differences found between students based on their total essay score. This makes intuitive sense, as they all performed well on the recall category, with the professor-responsibility pre-service teachers having the highest score. Given there were length requirements for the essay, it makes sense that those most dependent on the professor would spend more time and space on the surface-level assessment criteria and less on the criteria that fit in higher-order categories of learning outcomes.

Anderson and Krathwohl (2001) stated that the create category is the most advanced and complex along the cognitive dimension. It is not surprising that students scored lowest on this category, as it was the most challenging. The high remember scores, differences found among the understand and apply scores, and the low create scores are indicative of a final assignment that is appropriately scaffolded to the learners' level (Vygotsky, 1978). Scoring criteria at the create level allows for challenge and raises the standard to just within reach of the pre-service teachers. Demonstrating understanding and application of course content was an acceptable level of challenge to differentiate between pre-service teachers.

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Limitations

Constructivism may be enacted in various ways, according to the professor's interpretation of this philosophy or reliance on a particular constructivist theory (e.g., activity theory, situated cognition, Vygotsky's socio-historical theory). Professors and teachers work in silos, thus it is unlikely that the professor of the course under study enacted their constructivist perspective in an identical manner to other professors of teacher education. Comparison studies of courses that claim to use a constructivist approach would shed some light on this issue. Further, comparison studies including courses that do not claim a constructivist approach could document advantages of constructivist-oriented instruction. In support of the course studied herein, the results demonstrated the hypothesized enactment and outcomes of constructivist-oriented pedagogy.

Although breaking down the essay into meaningful components is a strength of the current study, it can also be seen as a weakness in that it is difficult to compare these results to existing empirical studies given that other researchers tend to look at essays holistically. In terms of the methodology, it is important to note that the relatively small sample size in the present study limits our ability to generalize the results and does not allow us to examine potential gender differences. Given our current knowledge that there are significant gender differences in learning styles, approaches to learning, and participation in university courses, future studies should compare men and women to see whether such differences influence students' learning outcomes. Given that most participants in the current study were either physical education or music pre-service teachers, the results may not reflect the experiences of pre-service teachers in other areas. The generalizability of these results may therefore be limited.

Finally, the current study was limited to understanding the development of practical theory in an educational psychology course without considering other experiences that students were exposed to concurrently. Subsequent studies should acknowledge the multiple contexts in which this development of practical theory can occur. By studying these multiple contexts simultaneously, we may better understand how they interact to influence this development.

Implications

Professors could administer simple needs assessments consisting of brief open-ended questions to assess the extent to which their students are aligned with the learning environment they are trying to create. Current findings should motivate professors to recognize their students as situated in learning environments. Professors are encouraged to motivate their students to actively recognize and become involved in the classroom culture as this may inadvertently facilitate meaningful learning outcomes for their students. The second implication of this study is related to instructional design in teacher education programs. Professors are encouraged to engage pre-service teachers in reflective learning activities by using their prior

classroom experiences to engage them in reflective practice while learning concepts and propositions in theories of learning and instruction.

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