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AUTHOR Jablonski, Ann M.
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ABSTRACT

This study investigated components of preservice training likely to influence the development of expertise in teaching. The study examined whether perceived self-efficacy, cognitive skills for teaching, basic teaching skills, beginning training teacher performance, knowledge of subject matter, knowledge of teaching, teacher work environment, and teacher characteristics would predict end-training preservice teacher performance. A group of 16 liberal arts and business graduates who completed a preservice elementary education program completed survey instruments, tests, and interviews. Data also came from direct observation, videotape recordings, and admissions and program records. Researchers collected the behavioral, cognitive, and background data, then organized them into prediction and outcome domains using a structural model. Data analysis indicated that perceived self-efficacy was a significant predictor of performance. Two types of end-year teaching performance (appropriate patterns of instruction and off-task activity) were significantly predicted by teaching performance and cognitive skills. Teaching performance was dependent on initial training. The study concludes that end-year teaching performance is related to the degree to which interns have acquired cognitive models and have learned to apply them. (Contains 20 references.) (Author/SM)

FACTORS INFLUENCING PRESERVICE TEACHERS' END-OF-TRAINING TEACHING PERFORMANCE

Ann M. Jablonski

Fordham University Graduate School of Education
New York, NY

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Factors Influencing Preservice Teachers' End-Of-Training Teaching Performance

Ann M. Jablonski
Fordham University Graduate School of Education

ABSTRACT: In this study components of preservice teacher training likely to influence the development of expertise in teaching were investigated by asking: Do perceived self-efficacy, cognitive skill for teaching, basic teaching skills, beginning-training teaching performance, knowledge of subject matter, knowledge of teaching, teacher work environment, and teacher characteristics predict end-training teaching performance of preservice-teachers? Data on students enrolled in a post-baccalaureate elementary-teacher preservice program were organized into prediction and outcome domains using a structural model. Two types of end-year teaching performance--appropriate patterns of instruction and off-task activity--were significantly predicted by summer teaching performance and cognitive skill. Summer teaching performance was dependent on initial training. Three conclusions emerge from this study. First, end-year teaching performance is related to the degree to which the interns have acquired cognitive models and have learned to apply them. Second, since this is not an experimental study it cannot be concluded that cognitive skill causally predicts performance. The causal relation between cognitive skill and performance will be investigated as a next phase of this study. Third, it seems appropriate for preservice programs use cognitive models as a basis for performance training.

Introduction

One of the perennial questions teacher educators face is what are the components of preservice teacher training that influence the development of expertise in teaching.

Various factors related to teachers who are effective, competent, and expert have been investigated in a number of studies. Ryans (1960) examined the characteristics of effective teachers. Process-product researchers identified dimensions of effective teaching, including classroom management, time on-task, teacher responses to students, and questioning patterns (Brophy & Evertson, 1974; Emmer et al., 1980; Good & Grouws, 1975; McDonald & Elias, 1976; Stallings & Kaskowitz, 1974). Teacher behavior has also been related to teachers' perceived self-efficacy (Ashton & Webb, 1986; Emmer & Hickman, 1991; Gibson & Dembo, 1984; Gorrell & Capron 1988; Housego, 1992; Saklofske et al., 1988; Woolfolk & Hoy, 1990), and to teachers' cognition (Housner & Griffey, 1985; Leinhardt & Greeno, 1986; Leinhardt et al., 1987; Peterson & Clark, 1978; Peterson & Comeaux, 1987). The conditions of the teachers' workplace have been identified as influencing teacher's opportunity to develop their teaching skills.(Rosenholtz, 1989).

If strong perceived self-efficacy, high levels of cognitive and behavioral skills, and in depth knowledge of subject matter are part of the make-up of expert teachers, then a training program that enables novice teachers to acquire these skills is essential.

The present study asks: Do perceived self-efficacy, cognitive skill for teaching, basic teaching skills, beginning-training teaching performance, knowledge of subject matter, knowledge of teaching, teacher work environment, and teacher characteristics, predict end-training teaching performance of preservice-teachers.

Structural Model

A structural model (Figure 1) was developed for organizing the data into prediction and outcome domains. Prediction data were organized in two stages. Data collected during the summer training program were assigned to Stage One (Figure 2) and included measures for status characteristics, knowledge of subject matter, knowledge of teaching, and summer (initial) teaching performance. Data relating to the internship year comprised Stage Two (Figure 3) and included measures of summer teaching performance, workplace conditions, basic teaching skill, cognitive skill, and perceived self-efficacy. Outcome domain consisted of end-year teaching performance data.

Two outcome variables measure the degree to which the intern at the end of the training program conducts instruction that is known to be effective. The first outcome variable identifies non-appropriate patterns of instruction; the second outcome variable indicates productive activities.

Figure 1.

Proposed Structural Model of the Domains of Variables Influencing Beginning Teaching Performance

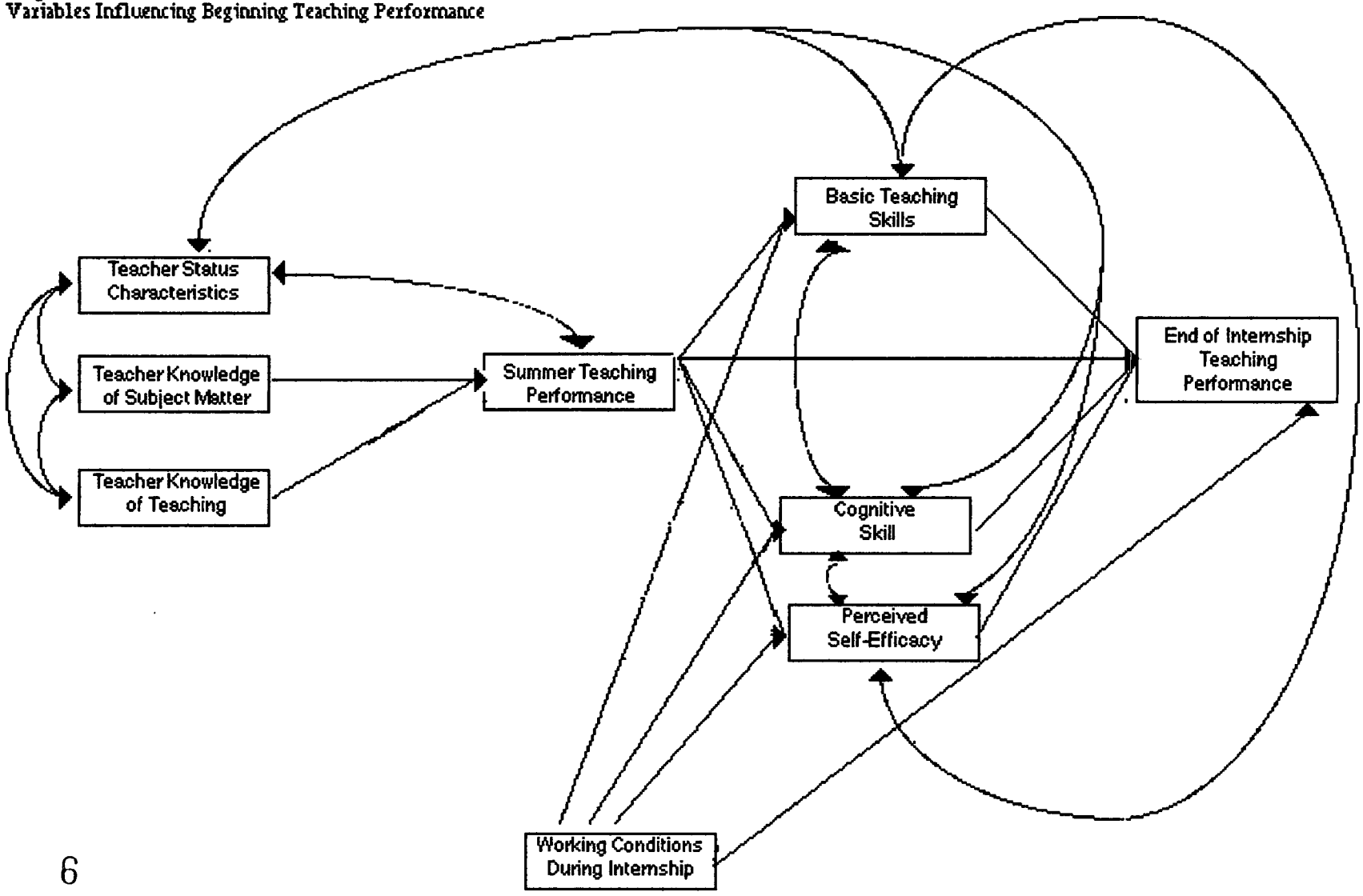


Figure 2.

Proposed Stage 1 Domains of Variables

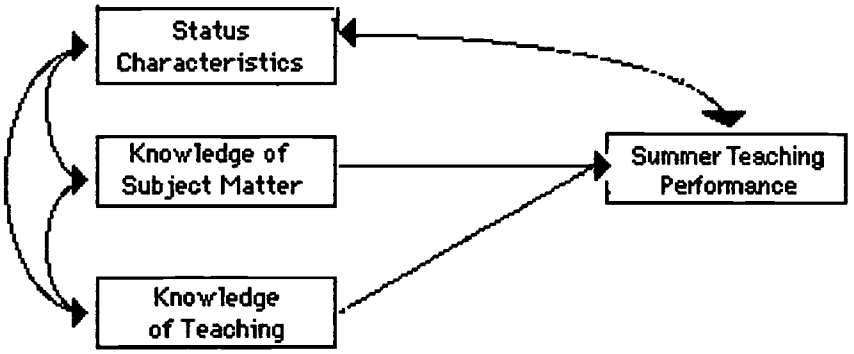
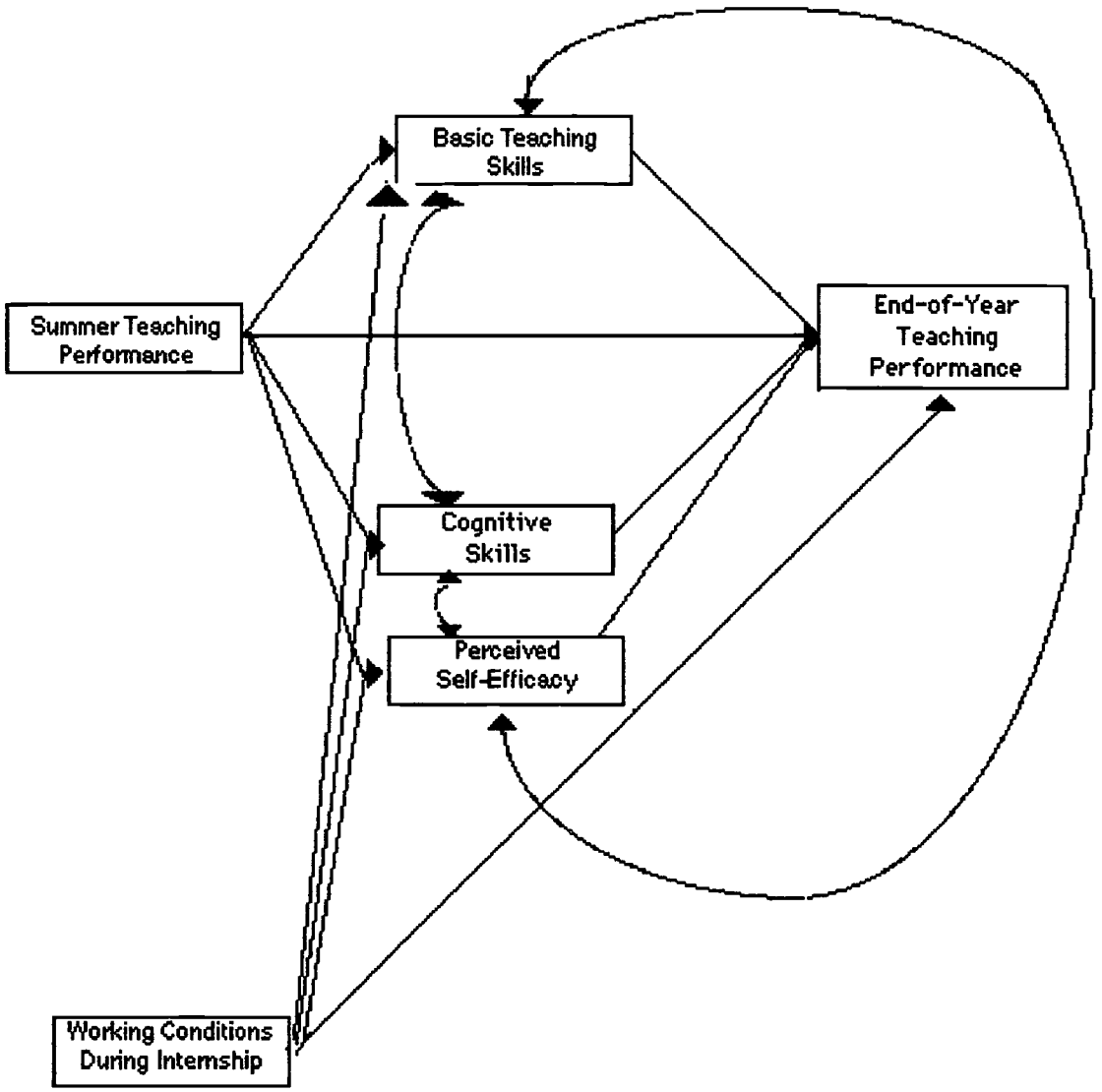


Figure 3.

Proposed Stage 2 Domains of Variables



Method

Sample

The sample for this study consists of a cohort of 16 liberal arts and business graduates who successfully completed an elementary-teacher preservice program. The 15-month post-baccalaureate program included of an intensive instructional training laboratory during the summer and a full-year full-time teaching internship in an urban elementary school classroom.

Instrumentation

Data Sources

Data for the eight domains of variables in this study were generated from multiple sources of information collected for each intern during the 15-month program. Data was collected through direct observation, survey instruments, tests, interviews, and video tape recordings. Data was also gathered from admissions information and program records. These data were intended for use in meeting the training needs of the interns and for tracking and developing the program.

Data Organization

The collected data represented three types of information: behavioral information, cognitive information, and background information. Behavioral data included direct observations of intern teaching by mentors and principals, video tape recordings of intern teaching, lesson plans and class materials developed by the interns during the Instructional Training Laboratory (Jablonski, 1992) and during the internship, and records of interns' teaching responsibilities during the internship. Cognitive data included an interview on teacher thinking, three surveys to obtain teacher's perceptions of self-efficacy, and results from the standardized testing. Background information included data on interns' personal and educational status, and data about the internship setting.

The data were assigned to domains of variables identified in the causal model.

Teaching Skills, Knowledge of Teaching Processes. Domains to which cognitive data were assigned included Knowledge of Subject Matter, Cognitive Skills and Perceived Self-Efficacy. Domains containing background data were Status Characteristics and Working Conditions.

Teaching Performance. The domain of Teaching Performance consisted of data on the instructional and classroom-management procedures that the intern used to facilitate learning. These data were generated through direct observation of interns while they were teaching at two points during their training: during the summer Instructional Training Laboratory and at the end of the internship year.

Status Characteristics. Selected Status Characteristics of the interns in this study was an exogenous domain of variables which includes age, sex, ethnicity, race, religion, and undergraduate education background of the interns. These data were obtained from program records.

Knowledge of subject matter. The domain of Knowledge of Subject Matter was defined as the intern's knowledge of the subject areas typically taught in elementary school including reading, mathematics, language arts, science, and social studies. Data for this domain were obtained from results of a standardized test taken by the interns.

Knowledge of teaching practices. The domain, Knowledge of Teaching Practices contained measures of knowledge about how to teach including the intern's understanding of methods, and strategies for effective management of the learning environment, for effective instruction, and for evaluation of learning. Data from the

Instructional Training Laboratory were used to assess the intern's knowledge of how to teach.

Working conditions during internship. The domain of variables identified as Working Conditions During Internship included school size, class size and ethnicity, intern work load, and the support system in the school.

Basic Teaching skills. The domain of Basic Teaching Skills contained measures of intern's skill in planning and organizing lessons, in managing the learning environment and in directing students toward learning obtained from direct observations by mentors and school principals.

Cognitive skills. The domain of Cognitive Skills contained measures of the cognitive structures and processes present in the intern's thinking during teaching. Data for this domain were obtained from an interview conducted with each intern.

Perceived self-efficacy. This study conceptualized the perceived self-efficacy of teaching interns as the judgment they make about their skills to carry out the tasks of teaching so that students learn. Data for this domain were obtained from self-report instruments.

Data Analysis

Data for each of the eight domains of variables in the proposed structural model were reduced using principal components factor analysis with oblique rotation. Second-order factor scores were used in multiple regression analysis. Twenty second-order factors were generated. In addition the standard score for ratings of summer teaching performance, was also used as a performance variable in the analyses. The names and labels as well as descriptive statistics for these 21 variables are contained in Table 1. Table 2 contains the Pearson correlation matrix for the 21 variables among which 21 correlations were significant (1-tailed at $p \leq .05$).

Table 1

Descriptive Statistics for Twenty-one Variables Used in Multiple Regression Analyses (N=16)

Variable	Var Abr.	Mean	Std dev	Minimum	Maximum	Label
AD1SCEAO	A	.00	1.00	-1.38739	2.08560	Educational achievement
BD1SCPBO	B	.00	1.00	-1.07731	2.26828	Personal background
CD2CTBSO	C	.00	1.00	-1.27228	1.88604	Knowledge of subject matter
DD3ITLO	D	.00	1.00	-1.78459	1.67584	Knowledge of teaching practices
ED4SCHEO	E	.00	1.00	-1.54586	1.73898	School environment
FD5BTTO	F	.00	1.00	-1.53937	2.54364	Basic teaching techniques
GD5PARO	G	.00	1.00	-1.72.12	1.48950	Procedures and routines for engaging students
HD6CGSKO	H	.00	1.00	-1.80936	2.01345	Cognitive skill for teaching
ID6DMSKRO	I	.00	1.00	-1.59955	1.97268	Decision-making skill for eval. reading
JD6PSKRO	J	.00	1.00	-1.04095	2.96395	Perceptual skill for evaluating reading
KD6PSKMO	K	.00	1.00	-1.85051	1.40141	Perceptual skill for evaluating math.
LD6DMSMO	L	.00	1.00	-1.37577	2.69866	Decision-making skill for eval. math.
MD7SEBIO	M	.00	1.00	-1.21059	1.71719	Beginning-year perceived self-efficacy for instruction
ND7SEBMO	N	.00	1.00	-2.25053	1.61292	Beginning year perceived self-efficacy for management
OD7SEEYO	O	.00	1.00	-2.05399	1.92016	End-of-year perceived self-efficacy
PD7SEMYO	P	.00	1.00	-1.91714	2.25860	Mid-year perceived self-efficacy
QD8STPPO	Q	.00	1.00	-2.03225	2.13802	Summer productive teaching activity
RD8STPNO	R	.00	1.00	-1.87931	1.66877	Summer non-productive teaching act.
SD8ETPNO	S	.00	1.00	-2.16228	2.01328	End-of-year non-productive teaching activity
TD8ETPPO	T	.00	1.00	-2.10815	1.35442	End-of-year productive teaching activity
VD8STPR	U	.00	1.00	-3.03056	.53481	Summer teaching performance ratings

Table 2

Pearson Correlation Coefficients for Twenty-One Variables (N=16)

	AD1SCEAO	BD1SCPBO	CD2CTBSO	DD3ITLO	ED4SCHEO	FD5BTTO
AD1SCEAO	1.0000					
BD1SCPBO	-.0682	1.0000				
CD2CTBSO	-.1447	-.0699	1.0000			
DD3ITLO	-.0226	.1646	.0206	1.0000		
ED4SCHEO	-.1760	-.0584	-.0460	.0801	1.0000	
FD5BTTO	.1812	.0679	.1529	.0785	-.0778	1.0000
GD5PARO	-.3609	.2206	.2700	.5524*	-.0985	.0817
HD6CGSKO	.2160	.4106	-.0986	.4486*	.0696	.4979*
ID6DMSRO	.0365	-.1091	-.3010	-.0557	-.2933	.0070
JD6PSKRO	-.0631	.1423	-.3886	-.1411	.3993	.0250
KD6PSKMO	-.1322	.1767	-.3671	-.0637	-.0654	-.5100*
LD6DMSMO	-.0133	.3414	.0128	-.3027	.2634	-.0390
MD7SEBIO	.2333	.1986	.0087	.2344	-.1334	.3497
ND7SEBMO	-.3590	.4294*	-.3285	-.0181	.3691	-.5054*
OD7SEEYO	-.4543*	.1238	.0805	.0946	-.2803	-.0829
PD7SEMYO	-.1061	.4356*	-.4340*	.0100	.4098	-.0375
QD8STPPO	.4602*	-.1023	-.1129	-.5770**	-.2104	-.0087
RD8STPNO	-.0906	-.1918	-.0421	-.0758	-.0375	.3611
SD8ETPNO	.1354	.3132	-.0597	.3125	-.1204	.2771
TD8ETPPO	-.3960	-.0189	.3570	-.0240	-.1248	.0096
VD8STPR	-.1983	-.2907	.0659	.1847	.3492	-.1637

	GD5PARO	HD6CGSKO	ID6DMSRO	JD6PSKRO	KD6PSKMO	LD6DMSMO
GD5PARO	1.0000					
HD6CGSKO	.0783	1.0000				
ID6DMSRO	-.1032	.2555	1.0000			
JD6PSKRO	.0450	-.1002	-.0827	1.0000		
KD6PSKMO	.2163	-.1350	.4447*	.0078	1.0000	
LD6DMSMO	-.0703	.0901	-.1082	.6442**	.1073	1.0000
MD7SEBIO	.0232	.0622	-.2530	.1750	-.2360	.2027
ND7SEBMO	.1355	-.1670	-.2394	.2789	.4241	.1697
OD7SEEYO	.3504	-.2101	.0973	-.1599	.3339	-.1466
PD7SEMYO	-.1062	.5578*	.2696	.4442*	.2438	.5432*
QD8STPPO	-.3758	-.2118	.2218	.0609	.3028	.3771
RD8STPNO	.1673	.2101	.5192*	-.0421	.3133	-.1444
SD8ETPNO	-.0135	.4540*	.1206	-.0916	-.0709	.2265
TD8ETPPO	.4749*	-.3481	-.1065	.1081	-.0182	.0489
VD8STPR	-.1574	-.3347	-.0230	.0501	-.0009	-.0680

	MD7SEBIO	ND7SEBMO	OD7SEEYO	PD7SEMYO	QD8STPPO	RD8STPNO
MD7SEBIO	1.0000					
ND7SEBMO	-.0543	1.0000				
OD7SEEYO	.0698	-.0902	1.0000			
PD7SEMYO	-.1216	.2703	.0142	1.0000		
QD8STPPO	.1031	-.2811	-.0259	.0309	1.0000	
RD8STPNO	-.0512	-.1570	.1783	.0564	-.0319	1.0000
SD8ETPNO	.4692*	-.1159	.0026	.2536	.2197	-.3268
TD8ETPPO	.2071	-.0283	.6372**	-.0780	-.0048	-.0219
UD8STPR	.3052	-.0173	.3503	-.1033	-.0774	-.0692

	SD8ETPNO	TD8ETPPO	VD8STPR
SD8ETPNO	1.0000		
TD8ETPPO	.0644	1.0000	
VD8STPR	.1758	.2729	1.0000

* $p \leq .05$ ** $p \leq .01$ (1-tailed)

Table 3

Description of Teacher For Each Predictor and Outcome Variable

Predictor Variable Labels	Description of teacher
A Educational achievement	• undergraduate college major and GPA
B Personal background	• age, religion, collegiate experience (location of college)
C Knowledge of subject matter	• knowledge of reading, language and mathematics skills taught in elementary grades
D Knowledge of teaching practices	• knowledge of beginning reading problems • knowledge of research on teaching • knowledge about teaching students in urban schools
E School environment	• support from school principal and mentor; • opportunity to work with other interns • school and class size and composition
F Basic teaching techniques	• basic skills for planning and teaching lesson, interacting with students , maintaining orderly classroom, and evaluating students • skills for on-task behavior of students
G Procedures and routines for engaging students	• manages student participation through feedback, questioning • manages student on-task behavior • develops lesson plans
H Cognitive skill for teaching	• monitors own activity and observes students • makes inferences and predictions about students; • processes instruction and solves problems
I Decision-making skill for evaluating reading	• makes decisions about reading based on student effort, task difficulty, strategies for dropping low marks • has systematic process for helping student who has difficulty in reading • uses reading tests for several purposes • makes or borrows tests to evaluate reading skills • decisions about reading include 'judgment call'
J Perceptual skill for evaluating reading	• makes general comments about student's improvement in reading during the year • perceives report card grade as indicator of student achievement • considers amount of home support a student has when generating grades, • uses a various types of items when composing a reading test
K Perceptual skill for evaluating math.	• makes general comments about student's improvement in mathematics during the year • perceives report card grade as indicator of student achievement • uses a various types of items when composing a math test • considers student effort when generating grades • makes or borrows tests to evaluate math skills
L Decision-making skill for evaluating. math.	• has systematic process for helping student who has difficulty in math • uses math tests for several purposes • makes decisions about reading based on strategies for dropping low marks • decisions about math include 'judgment call'

(table continues)

Table 3 continued

M Beg.-year perceived self-efficacy for management	• perceives self as having skills for managing the first day and first week of school using standardized tests for managing instruction giving students feedback and reinforcement observing other teachers manage class keeping records and using computers
N Beg. year perceived self-efficacy for instruction	• perceives self as having skills for lesson planning, record-keeping, managing a class, questioning students; evaluating students and giving feedback to students developing lessons using teaching/learning paradigms giving directions, supervising students and grouping students • perceives self as having overall competence to teach
O End-of-year perceived self-efficacy	• perceives self as having skills for lesson planning, record-keeping, managing a class, questioning students; evaluating students and giving feedback to students
P Mid-year perceived self-efficacy	• perceives self as having knowledge about teaching and managing reading lesson • perceives self as having skills to teach and manage reading lesson • perceives self as having skills to teach a math lesson
Q Summer productive teaching activity	• uses time for instruction, management, diagnosis, evaluation • is available to students • maintains direct control of who will speak and when • is either mobile or stationary • uses book, manipulations or paper/pencil as main materials • aim of lesson is introduction, practice, or review of new concepts or skills • presents lesson directly; may also direct recitation or question and answer • give positive, immediate verbal feedback that is task specific • has students speak, read aloud, or engage in physical activity • has student focus on either instructor or learning material • during lesson there is a low or medium level of student interaction • students contact with instructor depends on lesson • output rate and quality of student performance is high or medium • students are involved in and attend to lesson • student have low or medium levels of physical activity • noise in the classroom is medium

(table continues)

Table 3 continued

R Summer non-productive teaching act.	• provides advice at student's request while students work independently • responds to students requests for help • uses class time to prepare lessons • is not available to class or is available only to specific students • has system for having students take turns • has limited mobility around classroom • uses chalkboard as main instructional material • aim of lesson: to apply skill or reviews concepts • has students engage in relatively undirected general discussion (listen) or do seatwork (write) • gives both specific and general feedback • during lesson there is high interaction among students • no observation of student output
V Summer teaching performance ratings	• successfully taught nine required summer teaching episodes to individuals, small group and large groups

Outcome Variable Labels	**Description of teacher**
T End-of-year productive teaching activity	• uses time for instruction, management, facilitation, diagnosis, evaluation, preparation • is available to whole class and to specific students • maintains direct control of who will speak and when; also chooses volunteers and allows student to initiate • mobility may be stationary, limited or around classroom • uses book, chalkboard, equipment or paper/pencil as main materials • aim of lesson is introduction, practice, or review of new concepts or skills • presents lesson directly; may also use direct recitation or question and answer, seatwork, visual demonstrations • gives positive, immediate verbal feedback that is task specific; may also use expression as feedback • has students listen, speak, write, read aloud or silently, or engage in physical activity • has student focus on either instructor or learning material • during lesson there is a low or medium level of student interaction • students' contact with instructor may range from low to high • output rate and quality of student performance is high or medium • students have medium or high involvement in and attention to lesson • student physical activity may range from low to high • noise in the classroom may range from low to high
S End of year non-productive teaching activity	• spends time disciplining students • attends to classroom emergencies • uses workbooks • lesson aim is to practice facts and review concepts • lesson activities include games • feedback is delayed or undefined; feedback is negative • students respond by focusing on classmates or something else • student interaction with other students is high • student output rate is undefined

Results of Multiple Regression Analyses

Multiple regression analyses were performed using 1) All 19 variables as predictors of each end-year teaching performance variable; 2) seven summer variables as predictors of end-year teaching performance; 3) twelve internship year variables as predictors of end-year teaching performance;4) Stage 1 variables as predictors of summer teaching performance ; 5) Stage 2 variables as predictors of end-year teaching performance; 6) all significant predictors from analyses of Stage 1 and Stage 2 variables as predictors of end-year teaching performance. Three methods of regression analyses were used: simultaneous entry method, hierarchical method (based on beta weights), and stepwise method. Significant results of regression analyses described below are displayed in Tables 5 and 6 .

Regression Analyses for End-of-Year Productive Teaching Activity Using All Predictor Variables

A significant equation predicting End-of-Year Productive Teaching Activity resulted using both stepwise and hierarchical entry methods of entering 19 predictor variables into the regression equation (Multiple $R = .99$, $R^2 = .99$, $p < .013$). Nine variables were significant positive predictors while four variables were significant predictors as shown in column 2 of Table 4. Strongest positive predictors were end-of-year perceived self-efficacy, beginning-year perceived self-efficacy for instruction and decision-making skill for evaluating reading. Knowledge of subject matter, basic teaching techniques, educational achievement, beginning-year perceived self-efficacy for management, perceptual skill for evaluating reading and school environment were also positive predictors. Personal background was the strongest negative predictor followed by summer non-productive teaching activity, summer teaching performance ratings and perceptual skill for evaluating mathematics.

Table 4

Productive End-of Year Teaching Activity (Var T) Regressed on Various Sets of Predictor variables

Predictor Variables	1. 19 predictor variables using HE	2. 12 internship year variables using HE	3. 12 Int. yr. vars. and 3 SU Tch Pref. vars. using HE	4. Sig. Vars. (Stage 1 & Stage 2) using HE
A Educational achievement	.52			-.16
B Personal background	-1.13			
C Knowledge of subject matter	.98			
D Knowledge of teaching practices	x			-2.84
E School environment	.38	x	-.76	.26
F Basic teaching techniques	.58	(.36)	-1.15	-1.40
G Procedures and routines for engaging students	x	.95	1.36	2.22
H Cognitive skill for teaching	x	-1.72	.90	1.86
I Decision-making skill for evaluating reading	1.07	.38	x	
J Perceptual skill for evaluating reading	.41	-.80	.32	.58
K Perceptual skill for evaluating math.	-.34	-.69	-2.87	-.23
L Decision-making skill for evaluating. math.	x	x	-.30	-1.39
M Beg.-year perceived self-efficacy for instruction	.43	.41	-.70	1.04
N Beg. year perceived self-efficacy for management	1.44	x	1.63	-.78
O End-of-year perceived self-efficacy	1.71	x	.70	x
P Mid-year perceived self-efficacy	x	1.47	x	
Q Summer productive teaching activity	x		2.16	x
R Summer non-productive teaching act.	-.89		1.06	-.60
V Summer teaching performance ratings	-.82		1.06	.91
Multiple R	.99	.95	.99	.99
R^2	.99	.91	.99	.99
sig F	.013	.004	.0007	.002

( ) = non-significant beta weight
x = variable not included in sig equation

Empty cell = variable was not used in the analysis
HE = hierarchical entry method using beta wt.

Regression Analyses for End-of-Year Non-Productive Teaching Activity Using All Predictor Variables

A significant equation predicting End-of-Year Non-Productive Teaching Activity resulted using both stepwise and hierarchical entry methods of entering 19 predictor variables into the regression equation (Multiple $R = .98$, $R^2 = .96$, $p < .003$). Ten variables that contributed significantly to the equation are displayed in column 2 of Table 5. The strongest positive predictors were basic teaching techniques, decision-making skill for evaluating reading, and decision-making skill for evaluating mathematics. Other positive predictors were beginning-year perceived self-efficacy for instruction, knowledge of teaching practices, beginning year perceived self-efficacy for management and end-of-year perceived self-efficacy. Negative predictors were summer non-productive teaching activity, perceptual skill for evaluating reading and personal background.

Seven Summer Variables as Predictors of End-Year Teaching Performance

Seven variables related to summer training were analyzed as predictors of end-year teaching: educational achievement; personal background; subject matter knowledge; knowledge of teaching practices, summer productive teaching activity, summer non-productive teaching activity, and summer teaching performance ratings. No significant equations were found for either end-year outcome variable.

Table 5
Non-Productive End-of Year Teaching Activity (Var S) Regressed on Various Sets of Predictor variables

Predictor Variables	1. 19 predictor variables using HE	2. 12 internship year variables using HE	3. 12 Int. yr. vars. and 3 SU Tch Pref. vars. using HE	4. 12 Int. yr. vars. and 3 SU Tch Pref. vars. using SW
A Educational achievement	x			
B Personal background	-.51			
C Knowledge of subject matter	x			
D Knowledge of teaching practices	.34			
E School environment	x	x	-.83	-.78
F Basic teaching techniques	1.01	x	(.84)	1.08
G Procedures and routines for engaging students	x	x	.61	.60
H Cognitive skill for teaching	x	x	(-.25)	-.75
I Decision-making skill for evaluating reading	.88	x	x	x
J Perceptual skill for evaluating reading	-.69	(-.42)	(-.65)	-.88
K Perceptual skill for evaluating math.	x	x	(-.11)	.43
L Decision-making skill for evaluating. math.	.78	x	x	x
M Beg.-year perceived self-efficacy for instruction	.28	.60	x	(.21)
N Beg. year perceived self-efficacy for management	.77	x	(.25)	x
O End-of-year perceived self-efficacy	.27	x	(-.82)	-1.01
P Mid-year perceived self-efficacy	x	.51	(1.17)	1.56
Q Summer productive teaching activity	x		(.31)	x
R Summer non-productive teaching act.	-1.05		(-.57)	-.69
V Summer teaching performance ratings	x		1.04	.91
Multiple R	.98	.67	.98	.99
R^2	.96	.45	96	.98
sig F	.003	.055	058	.006

( ) = non-significant beta weight
x = variable not included in sig equation
SW = Stepwise method

Empty cell = variable was not used in the analysis
HE = hierarchical entry method using beta wt.;

Twelve Internship Variables as Predictors of End-Year Teaching Performance

Twelve variables related to training during the internship year were entered into regression equations predicting each end-year outcome variable: school environment; basic teaching techniques; procedures and routines for en gaging students; cognitive skill for teaching, decision-making skill for evaluating reading; perceptual skill for evaluating reading; decision-making skill for evaluating math; perceptual skill for evaluating math; beginning-year perceived self-efficacy for instruction; beginning-year perceived self-efficacy for management; end-of-year perceived self-efficacy; and mid-year perceived self-efficacy.

Stepwise and hierarchical methods for entering variables resulted in equivalent prediction equations for both outcome variables. End-of-year productive teaching activity was predicted by an equation containing significant seven variables (Multiple $R = .95$, $R^2 = .91$, $p < .004$). The variables in this equation are displayed in column 3 of Table 4. Positive predictor variables were mid-year perceived self-efficacy, procedures and routines for engaging students, beginning year perceived self-efficacy for management and decision-making skill for evaluating reading. Negative predictor variables were cognitive skill for teaching, perceptual skill for evaluating reading, and perceptual skill for evaluating math.

End-of-year non-productive teaching activity was predicted by an equation containing two significant variables: beginning-year perceived self-efficacy for instruction and mid-year perceived self-efficacy (Multiple $R = .67$, $R^2 = .45$, $p < .055$). Perceptual skill for evaluating reading was a non-significant variable in the equation. These variables are located in column 3 of Table 5.

Analyses for Stage 1 Variables

Stage 1 analyses (Figure 2) consisted of four predictor variables-- educational achievement; personal background; subject matter knowledge; and knowledge of teaching practices--and three outcome variables--summer productive teaching activity, summer non-productive teaching activity, and summer teaching performance ratings.

Each of the outcome variables was regressed on four predictor variables. This standard regression method of analysis yielded one significant regression equation for summer productive teaching activity (Multiple $R = .73$, $R^2 = .53$, $p = .05$,) as shown in Table 6. Significant predictors variables were knowledge of teaching practices (-.56) and educational achievement (.44). No significant prediction equations were found for either of the other outcome variables using any of the regression methods.

Analyses for Stage 2 Variables

Variables Used in Analyses

Stage 2 analyses (Figure 3) consisted of 15 predictor variables and two outcome variables. The predictor variables were: school environment; basic teaching techniques; procedures and routines for engaging students; cognitive skill for teaching, decision-making skill for evaluating reading; perceptual skill for evaluating reading; decision-making skill for evaluating math; perceptual skill for evaluating math; beginning-year perceived self-efficacy for instruction; beginning-year perceived self-efficacy for management; end-of-year perceived self-efficacy; mid-year perceived self-efficacy; summer productive teaching activity, summer non-productive teaching activity, and summer teaching performance ratings. The outcome variables were end-of-year non-productive teaching activity and end-of-year productive teaching activity.

Table 6

Analyses of Summer Outcome Variables Regressed on Stage 1 Variables

	Stage 1 outcome variables		
Predictor Variables	Q	R	U
A Educational achievement	.44	(-.11)	(.21)
B Personal background	(.01)	(-.19)	(-.34)
C Knowledge of subject matter	(-.03)	(-.07)	(.00)
D Knowledge of teaching practices	-.56	(-.04)	(.23)

( ) = non-significant beta weight

Regression Analysis for Stage 2 Variables

Separate regression analyses were performed for each of the two outcome variables--end-of-year non-productive teaching activity and end-of-year productive teaching activity-- with 15 predictor variables. No significant prediction equations were found for either outcome variable when all 15 predictor variables were entered simultaneously. When beta weights were used to select the order of entering the 15 predictor variables into an equation for each outcome variable, significant predictions were found. The computer-generated stepwise regression method also yielded significant prediction equations for both outcome variables.

End-of-year non-productive teaching activity. A significant equation predicting end-of-year non-productive teaching activity (displayed in column 4 of Table 5), was generated by entering variables hierarchically according to size of beta weight (Multiple R = 98, R^2 = .96, p = .05,). The equation contained 12 variables of which three variables contributed significantly to the equation ($p \leq .05$): procedures and routines for engaging students (.61), summer teaching performance ratings (1.04), school environment (-.83).

A significant equation was generated for end-of-year non-productive teaching activity using stepwise regression (Multiple $\underline{R} = 99$, $\underline{R}^2 = .98$, $\underline{p} = .006$). Ten of eleven variables made significant contributions to the equation ($\underline{p} \leq .05$) are located in column 5 of Table 5. Significant positive predictors were mid-year perceived self-efficacy (1.56), basic teaching techniques (1.08), summer teaching performance ratings (.91), procedures and routines for engaging students (.60), and perceptual skill for evaluating mathematics (.43). Significant negative predictors were end-of-year perceived self-efficacy (-1.01), perceptual skill for evaluating reading (-.88), school environment (-.78), cognitive skill for teaching (-.75), and summer non-productive teaching activity (-.69).

End-of-year productive teaching activity. End-of-year productive teaching activity, was significantly predicted (Multiple $\underline{R} = 99$, $\underline{R}^2 = .99$, $\underline{p} = .0007$,) by an equation containing 13 significant variables when the variables were entered according to beta weight. The results are displayed in column 4 of Table 4. Eight positive predictors were summer productive teaching activity (2.16); beginning-year perceived self-efficacy for management (1.63); procedures and routines for engaging students (1.36); summer non-productive teaching activity (1.06); summer teaching performance ratings (1.06); cognitive skill for teaching (.90);.end-of-year perceived self-efficacy (.70); and perceptual skill for evaluating reading (.32). Five variables were significant negative predictors: perceptual skill for evaluating math (-2.87); basic teaching techniques(-1.15); beginning-year perceived self-efficacy for instruction (-.70); school environment (-.76); and decision-making skill for evaluating mathematics (-.30).

When end-of-year productive teaching activity was regressed on 15 predictor variables using the stepwise regression method, the resulting equation was identical to the one produced using the hierarchical method above (see column 6 of Table 4).

Analyses for the Structural Model Using Variables from Stages 1 and 2

Multiple regression analysis for the structural model was performed for each outcome measure using variables found to be significant in analyses for Stages 1 and 2. The results of these analyses as displayed in columns 7 and 8 of Table 4.

End-of-year non-productive teaching activity. End-of-year non-productive teaching activity was regressed on thirteen variables--two significant predictor variables from analysis of Stage 1 variables and 11 significant predictor variables from analysis of Stage 2 variables: educational achievement; knowledge of teaching practices; school environment; basic teaching techniques, procedures and routines for engaging students, cognitive skill for teaching, perceptual skill for evaluating reading; perceptual skill for evaluating mathematics; beginning year perceived self-efficacy for instruction; end-of-year perceived self-efficacy; mid-year perceived self-efficacy; summer non-productive teaching activity and summer teaching performance ratings.

Simultaneous entry of the variables did not result in a significant equation. Hierarchical and stepwise regression methods yielded identical significant equations composed of 11 variables (Multiple $R = .99$, $R^2 = .98$, $p = .006$). Ten of the 11 variables made significant contributions to the equation ($p \leq .05$): mid-year perceived self-efficacy (1.57); basic teaching techniques (1.09), end-of-year perceived self-efficacy (-1.02); summer teaching performance ratings (.92); perceptual skill for evaluating reading (-.88); cognitive skill for teaching (-.79), school environment (-.75); summer non-productive teaching activity (-.70); procedures and routines for engaging students (.60); and perceptual skill for evaluating mathematics (.43). The final variable in the equation, beginning-year self-efficacy for instruction (.22), was nearly significant ($p = .08$).

End-of-year productive-teaching activity. End-of-year productive teaching activity was regressed on 15 variables--two significant predictor variables from analysis of Stage 1 variables, and 13 significant predictor variables from analysis of Stage 2 variables: educational achievement; knowledge of teaching practices; school

environment; basic teaching techniques, procedures and routines for engaging students, cognitive skill for teaching, perceptual skill for evaluating reading; perceptual skill for evaluating mathematics; decision-making skill for evaluating mathematics; beginning year perceived self-efficacy for instruction; beginning year perceived self-efficacy for management; end-of-year perceived self-efficacy; summer productive teaching activity; summer non-productive teaching activity; and summer teaching performance ratings.

Simultaneous regression procedure resulted in a significant equation (Multiple R = .99, R^2 = .99, p = .03) composed of 13 variables of which 10 were significant predictors ($p \leq .02$). Significant positive predictors were: procedures and routines for engaging students (2.20), cognitive skill for teaching (1.83); beginning year perceived self-efficacy for instruction (1.02); summer teaching-performance ratings (.90) and perceptual skill for evaluating reading (.57). Significant negative predictors were: knowledge of teaching practices (-2.80); basic teaching techniques (-1.38); decision-making skill for evaluating mathematics (-1.36); beginning year perceived self-efficacy for management(-.76); and summer non-productive teaching activity(-.59).

Hierarchical and stepwise methods for entering variables yielded identical significant equations composed of 13 variables (Multiple R = .99, R^2 = .99, p = .03). All 13 variables contributed significantly to the equation ($p \leq .01$) . Significant positive predictors were: procedures and routines for engaging students (2.22), cognitive skill for teaching (1.86), beginning year perceived self-efficacy for instruction (1.04); summer teaching performance ratings (.91) perceptual skill for evaluating reading (.58); and school environment (.26).

Significant negative predictors were: knowledge of teaching practices (-2.84); basic teaching techniques (-1.40); decision-making skill for evaluating mathematics(-1.39); beginning year perceived self-efficacy for management (-.78); and summer non-productive teaching activity (-.60) perceptual skill for evaluating mathematics (-.23) and educational achievement (-.16).

Discussion

This study shows that factors identified in the research as relevant to the acquisition of teaching skill, competence and expertness predict two types of end-training teaching performance for the preservice teacher: non-productive and productive patterns of instruction. All domains of variables have influence on these two performance outcomes which are in effect "undesirable" and "desirable" goals of teacher education.

Regression analyses in which 19 variables were entered into each equation provide the most complete picture of predictors of end-year productive and non-productive teaching activity. The significant predictor variables and their respective coefficients are located in Tables 7 and 8 which also include a description of the teacher represented by these variables.

Results of the study address several questions related to the training of teachers. What effect does initial training have on end-of-training performance? Does how the teacher thinks or what the teacher can do influence end-of-training performance? What effect does perceived self-efficacy have on end-of-training performance?

This study shows that admission criteria, initial training, or beginning teaching performance considered independently of extended teaching experience do not influence end-year performance. When factors related to initial training are combined with performance and cognitive skills acquired during the internship (as shown in the two equations of Tables 7 and 8) significant predictions are found for both productive and non-productive teaching. One interpretation for this result could be that the summer training represents limited measures of skill and knowledge acquisition when compared with the more complex activity of teaching in a classroom from day to day. A second related interpretation could be that the measurement of summer training variables did not adequately discriminate among individuals.

The significant prediction of each outcome variable for year-end teaching performance by both performance and cognitive variables addresses the second question.

The results of each equation, however, are puzzling. Both outcomes are significantly predicted by eight variables in common. Basic teaching techniques, decision-making skill for evaluating reading, beginning year perceived self-efficacy for management, beginning year perceived self-efficacy for instruction, end of-year perceived self-efficacy are significant positive predictors while summer non-productive teaching activity and personal background are common significant negative predictors for both outcome variables.

Common significant negative predictors of the outcome variables are personal background and summer non-productive teaching activity. One variable, perceptual skill for evaluating reading positively predicts for productive teaching and negatively non-productive teaching.

A few variables are unique to each equation. Unique positive predictors of productive teaching performance are educational achievement, knowledge of subject matter and school environment while summer teaching performance ratings and perceptual skill for evaluation math are negative predictors. Non-productive teaching performance has unique positive predictors of knowledge of teaching practices and decision-making skill for math.

Interpreting these results is perplexing. One approach is to examine the relative weight of the predictor variables in each equation. (This type of comparison is not usually recommended, in this case, however, since the same predictor variables are entered in each equation such examination is acceptable.). When the variables are entered into the regression equation for end-of-year productive teaching activity, 13 variables are significant predictors. With the exception of the basic teaching techniques and summer non-productive teaching activity variables which are the most significant positive and negative predictors of end-of-year non-productive teaching activity, all the variables are stronger predictors of end-year productive teaching activity than they are of end-year non-productive teaching activity.

A second approach is to compare the predictor variables for their relative strength within both equations. The best predictors of end-year productive teaching activity are end-

year perceived self-efficacy and beginning-year self-efficacy for instruction In contrast, end-year perceived self-efficacy is the weakest positive predictor and beginning-year self-efficacy for instruction is a moderate positive predictor of end-of-year non-productive teaching activity. Similarly, the best predictor of end-of-year non-productive teaching activity is basic teaching techniques which is only a moderate predictor of end-year productive teaching activity. On the basis of this approach, the results show that although perceived self-efficacy is predictive of both desirable and undesirable teaching performance, it more strongly predicts desirable teaching activity. The predictive relation of efficacy to non-productive teaching may be due to faulty self-efficacy judgments which are not uncommon among beginners.

A third approach is necessary to interpret the four predictor variables assessing decision-making and perceptual skills for evaluating reading and math. These may be the most difficult to interpret because they are paired by subject (reading vs. math) and by skill (decision-making vs. perception). Thus end-of-year productive teaching activity is predicted by cognitive skills used to evaluate reading but not cognitive skills to evaluate math. End-of-year non-productive teaching activity is predicted by decision-making skills used to evaluate both reading and math but not by perceptual skills. One interpretation may be that decision-making skills for evaluating reading and math represent the beginning teacher's use of more elementary processes for grading wherein the teacher makes decisions by using the sets of rules and follows them: step one, step two, step three. Perceptual skills for evaluation, in contrast, may require that the teacher see the "bigger picture," including how a student performs overtime and what external factors may affect student performance.

Thus, the two variables assessing what the teacher said about evaluating in reading may represent a picture of the teacher's systematic decisions and overall perception of student progress in this subject. The better these skills, the more a teacher is likely to engage in desirable teaching activity. In contrast, more skill in making only technical

evaluative decisions in either reading and math is predictive of undesirable end-of-year teaching.

It seems likely that although cognitive skills and performance predict end-of-year performance, measures of knowing how to think about teaching are better predictors of desirable end-of-training performance than prior teaching performance.. Productive teaching is significantly predicted by primarily by self-efficacy judgments, and decision-making and perceptual skills in the area of reading, in combination with knowledge of subject matter, use of basic teaching skills, prior educational achievement, and a supportive school environment. Non-productive teaching is predicted best by prior performance measured by basic teaching skills and cognitive decision-making skills. Beginning year self-efficacy judgments, some knowledge of how to teach and end-year self-efficacy beliefs also contribute, although less strongly to undesirable teaching.

In answer to the third question, perceived self-efficacy is a significant predictor of performance. These results are consistent with Bandura's theory of perceived self-efficacy. It is particularly significant that end-of-year perceived self-efficacy is the best predictor of productive end-of training teaching. That this variable also predicts undesirable teaching is probably dues to misjudgments of efficacy on the part of ineffective beginners.

Three conclusions emerge from this study. First, end-year teaching performance is related to the degree to which the interns have developed a strong sense of perceived self-efficacy and have acquired cognitive skills. Second, since this is not an experimental study it cannot be concluded that perceived self-efficacy causally predicts performance. The structural relation of perceived self-efficacy and cognitive skill with performance will be investigated as a next phase of this study. Third, it seems appropriate for preservice programs use training models that emphasized the development of self-efficacy and cognitive skill as a basis for performance training.

Table 7
Positive and Negative Predictor Variables for Productive End-of-Year Teaching Activity (Var T)

Beta Wt.	Predictor Variable Labels	Description of teacher
1.71	O End-of-year perceived self-efficacy (C)	• Teacher perceives self as having skills for lesson planning, record-keeping, managing a class, questioning students; evaluating students and giving feedback to students
1.44	N Beg. year perceived self-efficacy for instruction (C)	• Teacher perceives self as having skills for lesson planning, record-keeping, managing a class, questioning students; evaluating students and giving feedback to students developing lessons using teaching/learning paradigms giving directions, supervising students and grouping students • perceives self as having overall competence to teach
1.07	I Decision-making skill for evaluating reading (C)	For evaluating students in reading teacher talks about • making decisions about reading based on student effort, task difficulty, strategies for dropping low marks • using systematic process for helping student who has difficulty in reading • using reading tests for several purposes • making or borrowing tests to evaluate reading skills • using a 'judgment call' as part of the grading decision
.98	C Knowledge of subject matter (C)	Teacher has high scores on test of reading, language and mathematics skills taught in elementary grades
.58	F Basic teaching techniques (P)	• Teacher carries out basic tasks for planning and teaching lesson, interacting with students, maintaining orderly classroom, and evaluating students • Teacher maintains on-task behavior of students
.52	A Educational achievement	• Teacher's undergraduate college major and GPA
.43	M Beg.-year perceived self-efficacy for management (C)	• Teacher perceives self as having skills for managing the first day and first week of school using standardized tests for managing instruction giving students feedback and reinforcement observing other teachers manage class keeping records and using computers
.41	J Perceptual skill for evaluating reading (C)	For evaluating students in reading teacher talks about • making general comments about student's improvement in reading during the year • report card grade as indicator of student achievement • amount of home support a student has when generating grades, • using various types of items to a reading test
.38	E School environment	Teacher has: • support from school principal and mentor; • opportunity to work with other interns • school and class size and composition

(Table continues)

Table 7 continued

Beta Wt.	Predictor Variable Label	Description of Teacher
-1.13	B Personal background	• Teacher's age, religion, collegiate experience (location of college)
-.89	R Summer non-productive teaching act. (P)	Teacher instructional activities include: • provides advice at student's request while students work independently • responds to students requests for help • uses class time to prepare lessons • is not available to class or is available only to specific students • has system for having students take turns • has limited mobility around classroom • uses chalkboard as main instructional material • aim of lesson: to apply skill or reviews concepts • has students engage in relatively undirected general discussion (listen) or do seatwork (write) • gives both specific and general feedback • during lesson there is high interaction among students • no observation of student output
-.82	V Summer teaching performance ratings (P)	• Teacher successfully taught nine required summer teaching episodes to individuals, small group and large groups
-.34	K Perceptual skill for evaluating math. (C)	For evaluating students in math teacher talks about • making general comments about student's improvement in mathematics during the year • perceiving report card grade as indicator of student achievement • using a various types of items when composing a math test • considering student effort when generating grades • making or borrowing tests to evaluate math skills
.99	Multiple R	
.99	R^2	
.013	sig F	

(C) = Cognition--related to what the teacher thinks or says s/he thinks
(P) = Performance--related to what the teacher does

Table 8
Positive and Negative Predictor Variables for Non-Productive End-of-year Teaching Performance

Beta Wt.	Predictor Variable Labels	Description of teacher
1.01	F Basic teaching techniques (P)	• Teacher carries out basic tasks for planning and teaching lesson, interacting with students , maintaining orderly classroom, and evaluating students • Teacher maintains on-task behavior of students
.88	I Decision-making skill for evaluating reading (C)	For evaluating students in reading teacher talks about • making decisions about reading based on student effort, task difficulty, strategies for dropping low marks • having systematic process for helping student who has difficulty in reading • using reading tests for several purposes • making or borrowing tests to evaluate reading skills • using a 'judgment call' as part of the grading decision
.78	L Decision-making skill for evaluating. math. (C)	For evaluating students in math teacher talks about • having systematic process for helping student who has difficulty in math • using math tests for several purposes • making decisions about reading based on strategies for dropping low marks • using a 'judgment call' as part of the grading decision
.77	N Beg. year perceived self-efficacy for instruction (C)	• Teacher perceives self as having skills for lesson planning, record-keeping, managing a class, questioning students; evaluating students and giving feedback to students developing lessons using teaching/learning paradigms giving directions, supervising students and grouping students • Teacher perceives self as having overall competence to teach
.34	D Knowledge of teaching practices (C)	Teacher demonstrates through testing • knowledge of beginning reading problems • knowledge of research on teaching • knowledge about teaching students in urban schools
.28	M Beg.-year perceived self-efficacy for management (C)	• Teacher perceives self as having skills for managing the first day and first week of school using standardized tests for managing instruction giving students feedback and reinforcement observing other teachers manage class keeping records and using computers
.27	O End-of-year perceived self-efficacy (C)	• Teacher perceives self as having skills for lesson planning, record-keeping, managing a class, questioning students; evaluating students and giving feedback to students

(table continues)

Table 8 continued

Beta Wt.	Predictor Variables Labels	Description of teacher
-1.05	R Summer non-productive teaching act. (P)	Teacher instructional activities include: • provides advice at student's request while students work independently • responds to students requests for help • uses class time to prepare lessons • is not available to class or is available only to specific students • has system for having students take turns • has limited mobility around classroom • uses chalkboard as main instructional material • aim of lesson: to apply skill or reviews concepts • has students engage in relatively undirected general discussion (listen) or do seatwork (write) • gives both specific and general feedback • during lesson there is high interaction among students • no observation of student output
-.69	J Perceptual skill for evaluating reading (C)	For evaluating students in reading teacher talks about • making general comments about student's improvement in reading during the year • report card grade as indicator of student achievement • amount of home support a student has when generating grades, • using various types of items to a reading test
-.51	B Personal background	• Teacher's age, religion, collegiate experience (location of college)
.98	Multiple R	
.96	R^2	
.003	sig F	

(C) = Cognition--related to what the teacher thinks or says s/he thinks
(P) = Performance--related to what the teacher does

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Printed Name/Position/Title: Ann M. Jablonski

Organization/Address: Ann Jablonski, 406 East 80th Street, New York, New York 10021

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FAX: 212-861-8851

E-Mail Address: ajablonski@rsgi.org

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