Predictors of U.S. and Taiwan Kindergarten Teachers'

Beliefs about Developmentally Appropriate Practices

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Abstract

The purposes of the present study were to (1)examined the effectiveness of teachers' demographic and classroom characteristics on predicting U.S. and Taiwan public and private kindergarten teachers' DAP and DIP beliefs by using hierarchical regression; (2) identify the salient factors related to the variability of developmentally appropriate practices beliefs in the four groups. Three hundred and forty-one kindergarten teachers participated in the study. The group sizes were 119, 114, 55, and 53 for Taiwan private, Taiwan public, U. S. private, and U. S. public kindergarten teachers, respectively. A survey was used to collect data. Findings showed: (1) hierarchical regression analyses using teacher's personal demographic variables as the first block and numbers of boys and girls as the second block were generally not effective; (2) there were different sets of best predictors from the backward regression for developmentally appropriate beliefs and for developmentally inappropriate beliefs.

Keywords: beliefs; developmentally appropriate practices (DAP); kindergarten teacher

Introduction

Over two decades, developmentally appropriate practice (DAP) has been recognized as the foundation of best practices for early childhood education in the U. S. (Copple & Bredkamp, 2009). It is a set of guidelines for practices to work with children from birth to age eight. The guidelines not only address the importance of age appropriate and individual appropriate practices, but also emphasize the significance of social and cultural appropriate practices in early childhood programs (Copple & Bredkamp, 2009).The two purposes for DAP are: (a) enhancing the quality of early educational experiences for young children in early childhood programs by using developmentally appropriate activities, materials, and expectations (Bredekamp, 1987); and (b) balancing academic instruction in early childhood programs with other social, emotional, and physical development aspects (Bredekamp & Copple, 1997). Human development and learning theories, individual characteristics and experiences, and the social and cultural contexts of children formulated developmentally appropriate practice (DAP) (Jambunathan, Burts, & Pierce, 1999). The theories of Piaget, Gardner, Bowlby, Erikson, Bronfenbrenner, and Vygotsky laid the foundation of the twelve principles of DAP.

When Developmentally Appropriate Practice guidelines were published, in the U.S., some early childhood education researchers and educators raised concerns about how these practices were being implemented in early childhood education programs. Researchers (Bryant, Clifford, & Peisner, 1991; Buchanan, Burts, Bidner, White, Charlesworth, 1998; Buts, Buchanan, Charlesworth, & Jambunathan, 2000; Charlesworth, Hart, Burts, & Hernandez, 1991; Charlesworth, Hart, Burts, Thomasson, Mosley, & Fleege, 1993; Ernest, 2001; Fei, 1995; Fore, 1992; Hamilton, 1994; Harman, 2001; Hoot, Bartkowiak, & Goupil, 1989; Hyson, Hirsh-Pasek, & Rescorla, 1990; Irvine, 1993; Kim, 2005; Lu, 1993; McMullen, 1999; Mayers, 1991; Sedgwick, 2003; Smith, 1993; Smith, 1997; Vartuli, 1999) developed instruments or conducted research to measure teachers' beliefs regarding DAP.

Meanwhile, since the concept of DAP is spreading around the world (McMullen, Elicker, Wang, Erdiller, Lee, & Lin et al., 2005), studies about teachers' beliefs regarding DAP are found in Asian and European countries, such as Taiwan (Yang, 1997; Lin, 2004; Hsieh, 2004), South Korea (Kim, Kim, & Maslak, 2005; Kwon, 2004; Suh, 1994), China (Wang, 2000), India (Hegde, 2005; Hegde & Cassidy, 2009),

Greece (Doliopoulou, 1996; Sakellariou & Rentzou, 2011), and Hungary (Szente, Hoot, & Ernest, 2002). Cross-cultural studies between Taiwan and the U.S had been done by Yang(1997) and McMullen and her associates (2005). Yang (1997) compared U. S. and Taiwan kindergarten teachers' beliefs about DAP. McMullen and her associates (2005) compared self-reported beliefs and practices about DAP among early childhood education and child care professionals from the U.S., China, Taiwan, Korea, and Turkey. However, studies that compared predictors of Taiwan and U.S. public and private kindergarten teachers' beliefs regarding developmentally appropriate practice (DAP) were rare. The present study used teacher demographic variables and classroom variables to identify the best predictors that affect U.S. and Taiwan public and private kindergarten teachers' beliefs about developmentally appropriate practices.

Literature Review

Teachers' Beliefs

　　The definition of the term "belief" is various. Lloyd and Wilson (1998) and Thompson (1992) defined belief as conception, knowledge, understanding, preferences, meanings, and views. Belief also could be considered as the indicators of the certain ways that an individual behaves, manages information, and makes decisions (Bandura, 1986). Oliver and Koballa (1992) divided beliefs into eight categories: being equated with knowledge, precedes attitudes and behavior, a person holds true, personal convictions based on observation or logical reasoning, and an acceptance or rejection of a proposition. On the other hand, Pajares (1992, p.314) explained that belief as "values, which house the evaluative, comparative, and judgmental functions of beliefs and replace predisposition with an imperative to action".

　　As related to action, Piotrkowski, Botsko, and Matthews (2000) found that teachers' beliefs and decision making were related because their beliefs were the foundation of their daily decisions. Teachers' beliefs could related to beliefs about learners and learning, teaching, subject matter, learning to teach, and one's self and one's role (Calderhead, 1996). In this study, teachers' beliefs were divided as developmentally appropriate practices beliefs (DAPB) and developmentally inappropriate practices beliefs (DIPB). DAPB refers to kindergarten teachers'

conviction about developmentally appropriate practices (DAP) curriculum and teaching. DAP refers to child-centered teaching. Children are active learners, through interactions with adults, peers, and environment, and solving conflicts and problems, they construct meaningful knowledge. On the one hand, DIPB means teachers' curriculum and teaching beliefs tends to teacher-initiated and teacher-directed experiences.

Predictors of Teachers' Beliefs

The correlations between teachers' beliefs and their teaching have been focused in early childhood studies. The results showed teachers' beliefs had strong influences on the way they teach and their daily classroom teaching decisions (Hegde & Cassidy, 2009a, 2009b; Lara-Cinisomo, Sidle Fuligni, Daugherty, Howes, & Karoly, 2009; Ruto-Korir, 2010; Wang, Elicker, McMullen, & Mao, 2008). It is important not only to understand the current the relationship between teachers' beliefs and teaching, but also to identify the factors that affect teachers' beliefs. Why some teachers have more developmentally appropriate beliefs than others? A set of predictors' variables could examine the proportion of variance in teachers' beliefs.

Buchanan, Burts, Bidner, White, and Charlesworth (1998) used a variety of teacher demographic variables and classroom variables to identify the predictors for U.S. K-3 rd grade teachers' beliefs about DAP. The current study was interested in understanding whether in different cultural the predictors for U.S. and Taiwan public and private kindergarten teachers' beliefs about DAP would be similar. This could contribute to enhancing educational effectiveness (OECD, 2009) of U.S. and Taiwan kindergarten teacher education.

Like Buchanan and her colleagues' study, the present study included a set of teacher and classroom variables as predictors of teachers' beliefs about DAP. For teacher variables, age, gender, highest level of education, major of degree, minor of degree, certification, teaching years, years of teaching public/private kindergarten, experience of teaching children with disabilities, and years of teaching other grades were included. The literature showed that teachers with higher education level endorsed stronger DAP than their competitors with lower level of education (Han & Heuharth-Pritchett, 2010; McMullen & Alat, 2002). Also, studies documented that teachers with higher education would be more sensitive in teacher-child interaction and create advanced language (Burchinal, Cryer, Clifford, & Howes, 2002; Brown,

Molfese, & Molfese, 2008) and cognitive (Early et al., 2006) environment for young children. Thus, we expected that teachers who had higher education level would have beliefs more strongly related to the NAEYC guidelines than teachers with lower level of education.

We also expected that kindergarten teachers who majored or had certification in early childhood education or relative areas would report more DAP beliefs. Smith (1997) pointed out that teacher education programs should affect teacher beliefs. Thus, teachers in early childhood education might be taught more the principles of the NAECY guidelines than those who were not. Buchanan (1999) and Smith (1997) found that teachers majored in early childhood education or had certification in early childhood reported more DAP beliefs scores than teachers who did not major in early childhood.

As inclusions increasing in early childhood classrooms, kindergarten teachers are required to follow Individualized Educational Plans (IEPs) to meet young children's individual needs. That may make teachers focus on the individual differences of learners and have more commitment of individual instruction. Also, studies found that teachers with experience of teaching children with disabilities demonstrated more DAP beliefs (Buchanan et al., 1998). Thus, we expected that teachers had experience with children with special needs would had more agreement with the NAEYC guidelines than those teachers had teaching experience with only typically-developing children.

Holmes and Morrison (1994) and Abbot-Shim and Sibley (1997) pointed out that teachers of younger children were more likely to believe in DAP than teachers of older children. Therefore, years of teaching other grades would be expected to predict more DIP beliefs. Factors like teachers' age, gender, and years of teaching public or private kindergarten were less treated as predictors to examine the proportion of variance in teachers' DAP beliefs. Morrison, Jacobs, and Swinyard (1999) found that older teachers had difficult time to apply developmentally appropriate practice in their teaching due to they were taught in traditional practices. Yet, Abu-Jaber, Al-Shawareb, and Gheith (2010) found that older teachers' beliefs were more developmentally appropriate than younger teachers. On the other hand, most of kindergarten teachers are female. The researchers wanted to know if teachers' gender would predict their beliefs when having male sample in the study. Further, prior study (Karaagac & Threlfall, 2004) showed different settings' goals might influence teachers' beliefs.

Hence, the researchers were interested in understanding whether these factors contributed to the prediction of teachers' DAP and DIF beliefs or not.

For classroom variables, number of boy and number of girl in the class were used as predictors instead of class size. Studies had showed that having more children in the class predicted DIP beliefs (Buchanan et al., 1998). Hyun (1998) pointed out that most teachers tended to be more appreciate to girls' way of playing and constructing knowledge. Thus, we expected that teachers who had more girls in the classroom would indicate more agreement with the NAEYC guidelines than teachers had more boys in the classrooms. However, the effects of number of boy and number of girl in the class were unknown. Thus, the researchers included the two variables in the model control for their effects on teachers' DAPB and DIPB.

Method

Participants

Through U.S. and Taiwan contacts, 205 Taiwan public kindergarten teachers, 172 Taiwan private kindergarten teachers, 54 U.S. public kindergarten teachers, and 57 U.S. private kindergarten teachers were recruited. The survey instrument was mailed or delivered to each of the 488 teachers in this convenient sample. One hundred twenty-three (60%) of the Taiwan public teachers, 123 (71%) of Taiwan private teachers, 54 (100%) of U.S. public teachers, and 57 (100%) of U.S. private teachers returned the survey and became this study's sample. The participants were public and private full-time kindergarten teachers serving children ages four- to six-year-old. After handling the missing data and outlier issues, the final sample sizes for the Taiwan private group, Taiwan public group, U.S. private group, and U.S. public group are 119, 114, 55, and 53 respectively.

The reported ages of the four groups ranged from 22 to 55 ($M = 34.52$, $SD = 7.52$; Taiwan private), 25 to 60 ($M = 42.07$, $SD = 8.21$; Taiwan public), 20 to 68 ($M = 36.01$, $SD = 11.67$; US private), and 23 to 63 ($M = 34.83$, $SD = 10.37$; US public). Overall, the Taiwan groups were entirely female whereas the U. S. groups had approximately 15% male teachers. The majority of the teachers held bachelor's degree and the teachers in the public kindergartens had slightly higher education than their counterparts in the private schools. Whereas the Taiwan teachers primarily majored in early childhood education, especially for those in the public kindergartens,

the U. S. teachers had diverse education-related majors. At least over 70% of the teachers across the groups did not have a minor. The majority of the public kindergarten teachers were certified. The certification rates for the four groups were 44.4% (Taiwan private), 93.1% (Taiwan public), 28.8% (US private), and 100% (US public), respectively. Over 68% of the teachers in all of the four groups had teaching experiences with children with special education needs. Also, the majority of the teachers in all of the four groups was full-time teachers and did not have experiences teaching other grades except for 4-6 year-old children in preschool and kindergarten.

Instruments

Teacher Beliefs Scale

The Teacher Beliefs Scale of The *Teachers Beliefs and Practices Survey: 3-5 Year Olds* (Burts et al., 2000) designed by Burts and her colleagues based on 1997 National Association Education of Young Children Developmentally Appropriate Practice (DAP) guidelines (Bredekamp & Copple, 1997) was used to measure teacher beliefs about developmentally appropriate and inappropriate practices. The anchors of the Teacher Beliefs Scale are: 1 = *Not at All Important*, 2 = *Not Very Important*, 3 = *Fairly Important*, 4 = *Very Important*, and 5 = *Extremely Important*. There are 43 items on the Teacher Beliefs Scale (TBS) (one ranking question, 27 items of developmentally appropriate beliefs, and 15 items of inappropriate beliefs). The first question was not included in the analysis. The remaining 42 questions of the TBS examined teachers' beliefs about teaching kindergarten programs.

TBS has three factors: Beliefs about Developmentally Appropriate Practices (DAPB) (items 3, 4, 5, 8, 9, 12, 13, 16, 18, 21, 22, 23, 25, 26, 28, 29, and 33), Beliefs on Developmentally Inappropriate Beliefs (DIPB) (items 2, 7, 10, 11, 14, 15, 17, 19, 20, 24, 31, 29, 40, 41, and 42), and attitudes toward Family, Culture, and Inclusion (FCI) (items 6, 27, 30, 32, 34, 35, 36, 37, and 38). The FCI also was excluded from the analysis later. The internal consistency reliability coefficients in Cronbach alpha of DAPB and DIPB factors were .85 and .82 in Kim's (Kim, 2005) sample of 375 U. S. teachers, respectively. Using data from the current study, the Cronbach alphas of the two factors for the four groups were: .80 and .83 for Taiwan private; .82 and .80 for Taiwan public; .76 and .71 for US private; and .88 and .85 for US public.

Teacher Demographic Questionnaire

The teacher demography questionnaire was used to obtain teacher personal information, educational background, teaching experience, and current teaching position information. Considering the differences in educational settings in Taiwan from those in the U. S. and making the demographic variables comparable among the four groups, some items were removed or modified. For instance, teacher's educational backgrounds were modified from multi-choice questions to open-ended questions to accommodate the possibly different teachers' preservice educational paths in Taiwan. Teachers' and students' ethnicity and percentage of students qualifying for free lunch were removed as these questions were not applicable in Taiwan. The types of teaching environment was simplified as public and private as some of them did not exist in Taiwan (e.g., Head Start, faith-based child care).

Procedures

In Taiwan, after the participants were identified, a packet of information including letters explaining the purposes of the study, questionnaires, consent forms, and self-addressed stamped envelopes were sent or personally delivered to the contacts. Kindergarten teachers completed the questionnaires and consent forms independently, placed them in the self-addressed stamped envelopes, and returned them to the researcher. The same procedure had done for the U.S. participants as well.

Data Analysis Strategies

Through hierarchical regression analyses and backward regression analyses the researcher examined the ability of teacher characteristics and classroom characteristics to predict teachers' beliefs about developmentally appropriate practices.

Results

Multiple regression was selected to answer the research question for each of the four groups separately. The available teacher's demographic and classroom variables as two blocks were first used to predict the variance on DAPB and DIPB dependent variables subsequently. Although this method may reveal the relative contributions of the two blocks of variables, it may not be able to maximize the predictions due to the inclusion of unimportant predictor variables. Therefore, in the second step, the

backward regression was used to search the best prediction model for each group on DAPB and DIPB.

Selections of the Predictor Variables for the Hierarchical Regression Analyses

Initially, all of the eighteen variables except for kindergarten type in the demographic section of the survey were designed for the multiple regression analyses for each of the four groups. However, as full-time status and location of children receiving special education services were homogeneous across the four groups, they were excluded as predictors. Hours of training received in developmentally appropriate practices was eliminated as well because most of the U.S. and Taiwan teachers did not respond to the question. Teaching years in the current school was excluded also as it was highly correlated with total teaching years with coefficients greater than .80 in all of the four groups. Therefore, thirteen variables remained as the potential predictors. Of them, age, total teaching experiences, teaching years in public kindergarten, teaching years in private kindergarten, child age, numbers of boys and girls were continuous whereas the rest were categorical variables.

However, some variables were not applicable to all groups. For instance, gender was only meaningful for the U.S. public group and the Taiwan teachers usually did not have a minor. Also the data distribution patterns of the categorical predictors were not the same in different groups. For instance, Taiwan public school teachers predominantly had a major in early childhood education; the U. S. public kindergarten teachers had a variety of majors. Thus, it seemed reasonable to use a different set of predictors specifically applicable to each of the four groups. In addition, as the preferred minimum of observations to variable is 15:1(Hair et al., 2006), some categorical variables needed to be regrouped to maintain the sufficient occurrences for each of the subgroups for the categorical predictors. Hence, the predictors and the subgroups for each categorical predictor may be different across the four groups. Moreover, multicollinearity among independent predictors could have substantially adverse impact on the prediction model (Hair et al.). The multicollinearity among the predictors for the four groups was examined through the bivariate correlations (not presented in this paper).

For the Taiwan private group, the 14 predictors were grouped into two broad categories of teacher personal characteristics (i.e. age, gender, total teaching years,

years of teaching other grades, years of teaching private kindergarten, years of teaching public kindergarten, years of teaching disabled child, certification, education, major, and minor) and classroom environment (i.e. child age, number of boy, and number of girl). However, teacher's age, total teaching years, and teaching years in private kindergartens were highly correlated with one another with coefficients larger than .82. Only the variable of total teaching years was retained as a predictor whereas the other two were excluded as it was applicable to all of the four groups and educationally meaningful. Gender and minor were excluded as well for this group as most of teachers were female and did not have a minor. For major, due to the low frequencies of all but early childhood education, the initial eight categories were collapsed into two categories: early childhood education (ECE) and non-ECE with all of the other categories combined. For educational level, the data distribution seemed to suggest two groups: one with high school diploma and the associate degree and the other one with bachelor's degree and above. This was also true for the other groups. For child age, six classrooms served three-year-old children and four classrooms had children with mixed ages of four, five, or six year-olds. These classroom teachers were excluded. In addition, ten teachers failed to report children's ages in the classrooms. They were excluded as well, leaving 99 private kindergarten teachers serving children aged 4-6 year old in this group for the hierarchical regression analysis with 10 predictors.

For the Taiwan public group, gender, major, minor, certification were excluded as predictors because the Taiwan public teachers were predominantly females majored in early childhood education and certified without a minor. Also as in the Taiwan private group, teacher's age, total teaching years, and teaching years in public kindergarten were significantly correlated with one another at the .001 level with coefficients greater than .88. Thus, only total teaching experience was retained. Therefore, eight predictors remained as the predictors for this group. Twenty-one teachers reported their classrooms had mixed ages of 4-6 year olds. Six teachers failed to report children's ages. These 27 teachers were excluded for the multiple regression analyses, leaving 87 classroom teachers serving children aged 4-6 year-old.

For the U. S. private group, major was excluded due to the majority of the U.S. private kindergarten teachers majored in diverse non-early childhood education fields. Gender was excluded as a predictor as well because only five teachers were male. Fifty out of the fifty-five teachers taught five-year-old children, thus, child age was

also excluded from the predictor list. The correlations among age, total teaching experience in years, and teaching years in private kindergarten were less than .70 although significant at the .001 level, implying that the separate variances were greater than the shared variances among these three variables. Thus, they were all retained. Teaching other grades correlated with teaching public kindergarten experiences at .83 at the .001 level. As the former may be applicable to the other groups, the latter was eliminated. Therefore, ten predictors in teacher characteristics (i.e., age, education, minor, certification, total teaching years, experiences of teaching public and private kindergarten, and experience of teaching disabled child) and classroom environment (numbers of boy and girl) were used as the predictor variables for this group. Minor was coded as 1 = a minor (no matter what of the field) and 0 = no minor. Although the variable of teaching years initially was designed as continuous, the data demonstrated that it was skewed with almost half of the participants having three and less years (i.e., 49.1%). Thus, this variable was recoded as a dummy variable (teaching years of three and below as 0 and more than three years as 1). The same coding schemata were applied to the U. S. public group.

For the U. S. public group, child age, experience of teaching disabled child, and certification were homogeneous and were excluded as predictors. Teacher's age and teaching years in public kindergartens were excluded as well as they were highly correlated with total teaching experiences in years with coefficients greater than .72. Hence, the remaining nine variables were selected as the predictors for this group. Seven of them were teacher's characteristics (i.e., gender, education level, major, minor, teaching years, teach private, and teach disabled) and two of them are number of boys and girls in the classroom. Education was coded as 1 = Bachelor and 2 = Master. Major was recoded into two groups due to the low frequencies of the initial eight categories: the ECE group with early childhood education, early childhood to fourth grade, and interdisciplinary/ elementary and the non-ECE group with all of the other four categories combined.

Results of the Hierarchical Regression

Table 1 shows the results of the hierarchical regression on the two dependent variables for the two Taiwan school location groups. For the Taiwan private group, the predictions on DAPB was not significant either with the seven predictors of teacher's characteristics or with the second block of the three additional three

classroom variables included. However, the predictions on DIPB was significant at the .05 level with either the seven variables in the first block or the ten variables in the two blocks. The multiple R^2 for DIPB with seven predictors was .27. The corresponding adjusted R^2 were .20, medium effect sizes. The second block only contributed .01 to the predictions of DIPB. Thus, the variances of DIPB were largely explained by teacher's personal characteristics.

For the Taiwan public group, all of the predictions on the two dependent variables with the five teacher's characteristics were insignificant. With the three classroom variables added as the second block, the predictions were still not significant at the .05 level. These eight variables together did not significantly predict the variances on the two factors in Taiwan public kindergarten teachers.

Table 1

Hierarchical Regressions for Taiwan Private and Public Teachers Related to Teacher Beliefs

Groups	Predictors	DAPB	DIPB
Taiwan Private			
Block 1	Certification Education Major Teaching experience Teach other grades Teach public-K Teach disabled	$F(7,81) = 1.30$, $p = .26$, $R^2 = .10$, $R^2_{adj} = .02$	$F(7,81) = 4.21$, $p < .01$, $R^2 = .27$, $R^2_{adj} = .20$
Block 2	Child age Number of boy Number of girl	$F(10,78) = 1.38$, $p = .21$, $R^2 = .15$, $R^2_{adj} = .04$	$F(10,78) = 3.02$, $p < .01$, $R^2 = .28$, $R^2_{adj} = .19$
ΔR^2		.05	.01
Taiwan Public			
Block 1	Education Teaching experience Teach other grades Teach private-K Teach disabled	$F(5, 76) = 1.30$, $p = .27$, $R^2 = .08$, $R^2_{adj} = .02$	$F(5, 76) = .58$, $p = .72$, $R^2 = .04$, $R^2_{adj} = -.03$
Block 2	Child age Number of boy Number of girl	$F(8,73) = 1.24$, $p = .29$, $R^2 = .12$, $R^2_{adj} = .02$	$F(8,73) = 1.20$, $p = .31$, $R^2 = .12$, $R^2_{adj} = .02$
ΔR^2		.04	.08

Note:　DAPB = developmentally appropriate practice beliefs; DIPB = developmentally inappropriate practice beliefs. $p < .05$ = statistically significant level.

Table 2 shows the results of the hierarchical regression on the two dependent variables for the two U.S. groups. For the U. S. private group, the predictions with the eight teacher's characteristics were significant on DAPB and DIPB were significant at the .05 level. The eight demographic variables explained 33% of the variances on

DAPB or DIPB. With the two classroom variables (i.e., numbers of boys and girls) added as the second block, the results of the predictions remained similar on DAPB and DIPB were again significant. The second block variables additionally contributed 20% and 2% to the predictions of the variances on DAPB and DIPB, respectively. Overall, it seemed that the prediction on DAPB was more successful than the predictions on DIPB. About 53% of the variance on DAPB could be accounted for by these ten predictors. Even after the downward correction, the value of the adjusted R^2 was .41, a large effect size for multiple regression (Cohen, 1988).

For the U.S. public group, the predictions on the two dependent variables with the seven teacher's characteristics in the first block were not significant. The explained portion of the variances ranged from .04 to .05. The values of the adjusted R^2 corrected for different types of errors (e.g., random error, sampling error, and model specification error) were either trivial or meaningless (i.e., less than zero) possibly due to the too much error in the prediction models. With numbers of boys and girls added to the prediction as the second block, the predictions were not significant either. The contributions of these two variables were small or lower moderate. In summary, the predictions with the two blocks of variables for this group were generally ineffective.

Table 2

Hierarchical Regressions for US Private and Public Teachers Related to Teacher Beliefs

	Predictors	DAPB	DIPB
US Private			
Block 1	Age Education Minor Certification Teaching years Teach other grades Teach private-K Teach disabled	$F(8,43) = 2.61,$ $p = .02,$ $R^2 = .33,$ $R^2_{adj} = .20$	$F(8,43) = 2.67,$ $p = .02,$ $R^2 = .33,$ $R^2_{adj} = .21$
Block 2	Number of boy Number of girl	$F(10,41) = 4.57,$ $p < .001,$ $R^2 = .53,$ $R^2_{adj} = .41$	$F(10,41) = 2.21,$ $p = .04,$ $R^2 = .35,$ $R^2_{adj} = .19$
ΔR^2		.20	.02
US Public			
Block 1	Gender Teaching years Teach other grades Teach private-K Education Major Minor	$F(7, 45) = .69,$ $p = .68,$ $R^2 = .10,$ $R^2_{adj} = -.04$	$F(7, 45) = .66,$ $p = .71,$ $R^2 = .09,$ $R^2_{adj} = -.05$
Block 2	Number of boy Number of girl	$F(9, 43) = .55,$ $p = .83,$ $R^2 = .10,$ $R^2_{adj} = -.09$	$F(9, 43) = .65,$ $p = .75,$ $R^2 = .12,$ $R^2_{adj} = -.07$
ΔR^2		.00	.04

Note:　DAPB = developmentally appropriate practice beliefs; DIPB = developmentally inappropriate practice beliefs. $p < .05$ = statistically significant level.

Rationales for Selecting the Backward Regression

Although the hierarchical regression method may reveal the relative contributions of the two blocks of variables, it may not be able to maximize the predictions due to the inclusion of some unimportant predictor variables. To maximize the prediction in the case of lack of strong theories, backward regression is often used to search for the best model. Also, backward regression has the advantage of maximizing the prediction with the minimum subset of significant predictors. In deciding the best prediction model, the adjusted multiple R^2 was used as the criterion for the competing models as it is a potentially better estimate of the real effect in the population due to its correctness on sampling error (Snyder & Lawson, 1993). Generally a model with the largest adjusted R^2

was chosen as the best model. If several models had similar R^2, the one with the least number of predictors was designated as the best model.

Results of the Backward Regression

Tables 3-6 list the best model summaries on the two dependent variables in the four teacher groups. For the prediction on developmentally appropriate practice beliefs (DAPB) in the Taiwan private group, Table 3 shows this prediction was significant: $F(5, 83) = 2.63$, $p = .03$. The five predictors altogether could explain 9% of the variance on DAPB after the corrections, at the lower bound of the threshold for a medium effect size. Three predictors were salient: education, number of boys, and experience of teaching other grades. Teachers with higher education tended to have higher DAPB. With more boys in the classroom, teachers were less likely to hold DAPB. Experiences of teaching other grades than preschool and kindergarten were also inversely related to teacher's DAPB. Those who only taught young children tended to have higher DAPB than the counterparts with teaching experiences at other grades.

For DIPB in the Taiwan private group, the model with seven predictors had the largest adjusted R^2. The prediction was statistically at the .001 level: $F(7, 81) = 4.47$, $p < .001$. The seven predictors collectively could account for 22% of the variance on DIPB, a moderate effect size. Among the seven predictors, experiences of teaching other grades, education, certification, and major were the significant predictors at the .05 level. Except for experiences of teaching other grades, all of the other three predictors were negatively related to DIPB. In other words, teachers with higher education, with certification, and with a major in early childhood education had lower DIPB than has those with lower education, no certificate, or other non-ECE majors. Teachers with teaching experiences at other grades had more DIPB than those with teaching experiences with young children only.

Table 3

Backward Regression for Taiwan Private Group

	DAPB			DIPB		
	β	t	p	β	t	p
Predictors						
Education level	.25	2.38	.02	-.26	-2.47	.02
Teach other grades	-.21	-1.99	.05	.26	2.62	.01
Teach disabled	.16	1.52	.13	-.14	-1.40	.17
Number of boys	-.21	-2.02	.05	.12	1.19	.24
Number of girls	.17	1.62	.11	—	—	—
Certification	—	—	—	-.22	-2.08	.04
Major	—	—	—	-.20	-2.00	.05
Teaching years	—	—	—	.15	1.45	.15
Teaching public K	—	—	—	—	—	—
Child age	—	—	—	—	—	—
Model summary	$F(5,83) = 2.63, p = .03,$ $R^2 = .14, R^2_{adj} = .09$			$F(7,81) = 4.47, p < .001,$ $R^2 = .28, R^2_{adj} = .22$		

Note. Dashes indicate the predictor was not part of the best prediction model for the criterion variable. DAPB = developmentally appropriate practice beliefs; DIPB = developmentally inappropriate practice beliefs. $p < .05$ = statistically significant level.

Table 4 shows the best model summaries on the predictions of the two dependent variables for the Taiwan public group. For DAPB, the prediction was significant at the .05 level: $F(2, 79) = 3.07, p = .05$. These two variables could explain 5% of the variance on DAPB, a small effect size. Teaching experience was the salient predictor. Teachers with more experience had lower beliefs on DAP.

For DIPB, even this model with the largest adjusted R^2 was not significant as shown in Table 9: $F(5, 76) = 1.96, p = .09$. The five predicators collectively could explain 6% of the variance on DIPB. Individual predictors were not examined for the salient ones as the whole prediction model was not significant.

Table 4

Backward Regression for Taiwan Public Group

	DAPB			DIPB		
	β	t	p	β	t	p
Predictors						
Teaching years	-.22	-2.06	.04	—	—	—
Teach private-K				—	—	—
Teach other grade	—	—	—	.14	1.25	.22
Number of boy	—	—	—	.18	1.60	.11
Number of girl	.15	1.38	.17	.18	1.58	.12
Education	—	—	—	-.14	-1.27	.21
Child age	—	—	—	-.17	-1.49	.14
Model summary	$F(2,79) = 3.07, p = .05,$ $R^2 = .07, \ R^2_{adj} = .05$			$F(5,76) = 1.96, p = .09,$ $R^2 = .11, \ R^2_{adj} = .06$		

Note. Dashes indicate the predictor was not part of the best prediction model for the criterion variable. DAPB = developmentally appropriate practice beliefs; DIPB = developmentally inappropriate practice beliefs. $p < .05$ = statistically significant level.

For the U. S. private group, Table 5 shows the prediction of DAPB with the seven predictors was significant at the .001 level: $F(7, 44) = 6.62, p < .001$. These predictors altogether could explain 44% of the variance on DAPB, a large effect size. Three of the seven predictors were salient: teaching years in private kindergarten, teaching experience at other grades, and number of boys. They were all on the negatively related to DAPB. Teachers with more teaching years in the private kindergarten setting, more experiences of teaching other grades, or more boys in their classrooms tended to have lower DAPB.

For DIPB, Table 5 indicates teacher's education and age significantly predict DIPB: $F(2, 49) = 11.15, p < .001$. The two variables could predict 29% of the variance on DIPB, a large effect size. Teachers with lower education or older age children in classroom tended to report fewer DIPB.

Table 5

Backward Regression for United States Private Group

Predictors	DAPB			DIPB		
	β	t	p	β	t	p
Education	.16	1.32	.19	.50	4.23	.00
Minor	.19	1.63	.11	—	—	—
Certification	.26	1.86	.07	—	—	—
Teach other grades	-.42	-3.17	.00	—	—	—
Teach private-K	-.37	-3.43	.00	—	—	—
Number of boy	-.31	-2.17	.04	—	—	—
Number of girl	-.19	-1.30	.20			
Child age	—	—	—	-.27	-2.23	.03
Teach disabled	—	—	—	—	—	—
Model summary	$F(7,44) = 6.62$, $p < .001$, $R^2 = .51$, $R^2_{adj} = .44$			$F(2,49) = 11.15$, $p < .001$, $R^2 = .31$, $R^2_{adj} = .29$		

Note. Dashes indicate the predictor was not part of the best prediction model for the criterion variable. DAPB = developmentally appropriate practice beliefs; DIPB = developmentally inappropriate practice beliefs. $p < .05$ = statistically significant level.

For the U. S. public group, Table 6 shows the detailed results of the best model for the two dependent variables. Both of the prediction models were not statistically significant and the practical significances were trivial.

Table 6

Backward Regression for United States Public Group

Predictors	DAPB			DIPB		
	β	t	p	β	t	p
Gender	-.23	-1.59	.11	—	—	—
Teaching years	.24	1.69	.10	—	—	—
Teach other grades	—	—	—	—	—	—
Major	—	—	—	-.20	-1.37	.18
Number of girl	—	—	—	.24	1.66	.10
Number of boy	—	—	—	—	—	—
Teach private-K	—	—	—	—	—	—
Education	—	—	—	—	—	—
Model summary	$F(2,50) = 2.08, p = .14,$ $R^2 = .08, \ R^2_{adj} = .04$			$F(2,50) = 1.78, p = .18,$ $R^2 = .07, \ R^2_{adj} = .03$		

Note. Dashes indicate the predictor was not part of the best prediction model for the criterion variable. DAPB = developmentally appropriate practice beliefs; DIPB = developmentally inappropriate practice beliefs. $p < .05$ = statistically significant level.

Discussion

Conclusion and Discussion

The current study explored the possible salient factors influencing the U. S. and Taiwan teachers' developmentally appropriate beliefs. Due to the heterogeneity of the teacher's demographic variables, a universal set of predictors was not possible. Hence, four different sets of predictors were used for the four groups. In the first step, hierarchical regression was employed to compare the relative contributions of teacher's demographic variables and the classroom variables in terms of child composition. For the Taiwan private groups, findings from this study illustrated: (a) the predictions on DAPB was not statistically significant, (b) the predictions on the negative dimensions (i.e., DIPB) was significant at the .01 level with medium effect sizes, (c) the three classroom variables (e.g., child age, number of boys and number of girls) contributed little to the predictions of DIPB. For the Taiwan public group, all of the predictions on the DAPB and DIPB were not significant at the .05 level, even with

all eight predictors in the two blocks. For the U. S. private group, the results showed: (a) the predictions on DAPB and DIPB were significant with large or medium effect sizes, and (c) the two classroom variables (i.e., number of boys and girls) contributed significant to the prediction of DAPB whereas they were not significant contributors to the prediction of DIPB. For the U. S. public group, the prediction models were not statistically significant. The practically significances were also trivial.

In summary, findings from the hierarchical regression indicated: (a) the hierarchical regression was generally not effective in explaining the predictors of DAPB and DIPB; however, among the U. S. private group, DAPB was found with large effective size, (b) teacher's personal variables were generally more important than the child characteristics for the significant predictions except for the U. S. private group on DAPB, and (c) the predictions using teacher's personal characteristics in the two public groups were not effective. These results of insignificant or small predictions were consistent with other findings. Israsena (2007) reported four predictor variables (i.e., training group membership – currently being trained, trained five years ago, and no training on a child-centered curriculum; teacher's educational level; teaching experience in years; and total number students in the classroom) did not significantly predict the variability on any of the two dimensions using the Thai version of the same survey. Kim (2005) found seven predictors (i.e., permission for observation, education level, ECE background, years of teaching, number of children, percentage of free lunch, and locust of control) significantly predicted only about 13% of variances on the composite scores of DAP beliefs.

Due to the inclusion of the unimportant predictor variables and the relative small group sizes, in the second step, backward regression was used to search for the best models on developmentally appropriate/inappropriate beliefs in each of the four groups by using the same set of predictors as in the hierarchical regression. For the Taiwan private group, the backward regression demonstrated: (a) DAPB was predicted by five variables with a medium effect size. Of the five predictors, teacher education level, number of boys, and experience of teaching other grades were significantly important. Teachers' education level positively linked to DAPB. This finding is consistent with findings suggesting that teachers with higher education level endorsed stronger DAP than their competitors with lower level of education (Han & Heuharth-Pritchett, 2010; McMullen & Alat, 2002). Number of boys and experiences of teaching other grades were on the opposite direction. These findings are consistent

with findings suggesting that most teachers tended to be more appreciate to girls' way of playing and constructing knowledge (Hyun, 1998) and teachers of younger children were more likely to believe in DAP than teachers of older children (Holmes and Morrison, 1994; Abbot-Shim and Sibley, 1997); (b) DIPB was also significantly predicted with a medium effect size. Four predictors were significant. Teachers with a certificate, an early childhood education degree, or more years of education, had fewer DIPB than those without a certificate, had majored in a non-ECE field, or had less years of education. These findings may reflect that certification policy and the specialized early childhood preparation of all early childhood educators (Bredekamp & Copple, 2009; Smith, 1997) could affect teachers' beliefs toward the NAEYC guidelines. Experiences of teaching other grades had a positive relationship with DIPB for this group of teachers. This finding is consistent with studies suggesting that teachers of older children were more likely to believe in DIP than teachers of younger children (Holmes and Morrison, 1994; Abbot-Shim and Sibley, 1997)

For the Taiwan public group, teaching experiences and the number of girls in the classroom together significantly predicted DAPB with a small effect size. Teachers with more teaching experience valued DAPB less. This is possibly due to the fact teachers with less experience had more preservice training related to the NAEYC guidelines (Hart, Burts, & Charlesworth, 1997; Buchanan et al., 1998). However, DIPB cannot be predicted among this group. Further studies are needed.

For the U. S. private group, seven variables predicted about 44% of the variance on DAPB. Three predictors were salient. As in the Taiwan public group, teachers with more teaching experience had lower values on DAPB. This finding is consistent with the finding by Hart et al. (1997) that new teachers from teacher education programs may be taught the current content standards or practices that related to the NAEYC guidelines. Also similar to the Taiwan private group, teaching experience in other grades and number of boys in the classroom negatively related to DAPB. Teachers' years of education and age predicted 29% of the variance on DIPB. Strangely, teachers with more education had a higher value on DIPB. Younger teachers also had higher DIPB scores. These phenomena may be due to the fact that these teachers did not major in early childhood education or related fields and recognized the inappropriateness of DIPB in their teaching practices (Bredekamp & Copple, 2009). Or, older teachers had difficult time to apply developmentally appropriate practice in

their teaching due to they were taught in traditional practices (Morrison, Jacobs, and Swinyard, 1999).

For the U. S. public group, the prediction models of DAPB and DIPB were not statistically significant and the practical significances were trivial. Future studies are suggested.

Future Research

This present study considered several personal characteristics of teachers and three classroom variables. Future studies could include other variables from an ecological perspective. Teacher's familial factors, program variables, and community and societal characteristics may influence teachers' attitudes toward and behaviors on developmentally appropriate beliefs (Cryer, Tietze, Burchinal, Leal, & Palacios, 1999).

Implications

The multiple regression analyses on predicting different dimensions of developmentally appropriate/inappropriate beliefs in this study were preliminary and need further study. The salient factors and the underlying mechanisms linking to teachers' developmentally appropriate/inappropriate beliefs are challenging to be understood. This study was a beginning to understand belief factors and practices related to developmentally appropriate practice among Taiwan and U.S. teachers. This study could be replicated with additional teachers and in different areas.

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美國與台灣幼教師的發展合宜實務信念預測因素之研究

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摘要

　　本研究目的主要是識別與美國和台灣幼教師的發展合宜實務相關的顯著預測因素。三百四十一位幼教師參與本研究，台灣私立幼兒園教師、台灣公立幼兒園教師、美國私立幼兒園教師及美國公立幼兒園教師人數分別是 119 名、114 名、55 名和 53 名。問卷調查為主要的資料來源。研究結果顯示：(1)利用階層式迴歸分析逐一將教師個人背景變項和教學環境變項加入迴歸模式中，了解不同階段之迴歸模式的整體解釋力，發現其對幼教師發展合宜實務信念的預測效果不盡理想；(2)在反向淘汰式迴歸分析結果中發現，四組幼教師的發展合宜和發展不合宜信念各有其不同的預測因素。

關鍵字: 信念、發展合宜實務、幼教師