

A STUDY OF THE EFFECTS OF SCHOOL ENVIRONMENT,
TEACHER IDENTITY, AND STUDENTS' SELF-EFFICACY AND
INTERPERSONAL RELATIONSHIP ON LEARNING OUTCOMES OF
STUDENTS IN THE UNIVERSITIES IN HAINAN, CHINA

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Abstract

This study aimed primarily to investigate the effects of various variables, namely, school environment, teachers' professional identity, and students' self-efficacy and interpersonal relationship on students' learning outcomes in universities in Hainan, China. Samples in this study included the teachers and students of universities in Hainan. Five universities were selected, with 40 and 418 effective questionnaires returned from teachers and students, respectively. A data analysis was performed using hierarchical linear modeling (HLM). The research results showed that, at a school level, school resources and equipment had no effect on students' learning outcomes, while teachers' professional identity

facilitated students' performances; at an individual level of students, the better students' self-efficacy and interpersonal relationship were, the higher their learning outcomes were.

Key words: school environment, teacher identity, self-efficacy, interpersonal relationship, learning outcomes

Introduction

According to the Chinese Academy of Science and Technology for Development (2016), enhancing the Chinese capability for independent innovation and building an innovative country are the goals of the "Medium- to Long-Term Plan for the Development of Science and Technology (2006-2020)". To monitor and evaluate the progress of the effort in building an innovative country, the Academy has, since 2006, conducted research on the national innovation index, and clearly mentioned in the Plan that, by 2020, the contribution rate of science and technology progress from China has to reach 60%; and this contribute rate has been set as the goal of development. As students are critical to the development of the country in the future, the cultivation of science and technology innovation talents is thus the primary task. Walberg (1984) sorted out three main factors affecting students' learning achievements, which include the factors of students' qualities, teaching, and environment, all having important effects on students' learning achievements. In previous studies, scholars pointed out that school environment, teachers' sense of identity (Yang, 2017), students' self-efficacy and interpersonal relationship (Zhang, 2016), all have important effects on students' learning achievements.

Further, the studies of Pascarella and Terenzini (2005) indicated that the closer the interplay of school and social environments is (the higher the social capital is), the better the teacher-student interaction is, which is conducive to students learning performances. Esposito (1999) noted that the better the environment, equipment and reputation of a school is, the better teacher-student interactive relationship is, which facilitates the students learning performances. In addition, Pekurn, Frenzel, Goetz, and Perry (2007) pointed out that self-efficacy predicts and correlates with learning; the more confident students are of themselves in learning, the better their learning will be. In the review of foreign literature, it is found that teachers' self-efficacy and effective leadership improve all students' learning achievements.

The effect of teachers' self-efficacy on students' learning achievement exceeds that of class scale and school efficacy. Teachers with high efficacy increase the chance of students' success in learning (Taylor, Pearson, Clark & Walpole, 2000), and their effect on students' learning achievements is particularly prominent (Rockoff & Jonah, 2004). Students with high academic self-efficacy will be less easily affected by such negative emotions as anxiety and depression in the learning process, and

hence can achieve much better learning outcomes (Shankland, Genolini, Franca, Guelfi, & Ionescu, 2010).

Therefore, this study sought to analyze and investigate the effects of school environment, teacher identity, and students' self-efficacy and interpersonal relationship on students' performance in science through the method of questionnaire survey, with a view to understanding which factor(s) exerts an important effect on students' science performance. Based on this, recommendations are provided to improve and enhance the science competence of Chinese students, cultivate outstanding science talents, and set the goals for development.

Literature Review

Lin (2006) pointed out that students' performance in school would be subject to the influence of external environmental factors and internal personal factors. According to Bronfenbrenner (1988), from the perspectives of sociology and developmental psychology, human development is the continuous development of individuals in response to their environments; he further proposed the Ecological System Theory, in which the core level is called the micro-system. This system includes environments, people, events, and items having the most direct relations with an individual, whose qualities and personality engage in close interaction with them, such as the influence of family and school environments on the individual. Thus, school environment, and teachers' and students' personal factors may affect the performance of students.

A good school environment can stimulate the learning motivation of students to strive for excellence (Plucker, 1998). Lewin (1936) advanced the theory of "Person-Environment Interaction", whose core idea is that the behavior and performance of an individual is the product of interaction between environment and the individual's characteristics. A culture differs across schools, and such differences predicted students' learning achievements (Pariso, 1991). Tang (2003) referred to the quality of school environment as a state that infrastructure, equipment, and school environment are maintained holistically; various equipment of a school can meet or exceed the educational, living, and learning needs of users, positively affecting the instruction, learning, achievements, attitudes, health and behaviors of both teachers and students.

With respect to teachers, Kelchtermans (2000) argued that the teaching profession is highly self-involved, and that teachers' professional identity is a concept of the teacher as a teacher. Such an identity is an ongoing negotiated work, reflecting in this process an individual's perceptions of her/his profession, which include personal sense of belonging, personal commitment and personal views on education (Day, Elliot and Kington, 2005). Sablo-Sutton (2003) stated that identity of an individual is constructed as a result of her/his interaction with the various social environments she/he is in; identity is thus a dynamic structure, and professional identity is a continuously developing, changing and unstable state and process (Pillen, 2013).

Geijsel and Meijers (2005) also indicated that professional identity also comprises morality, emotions, politics, and teachers' personal values. Newman (2000) held that efforts to understand teachers' professional identity can start from several questions: what kind of teacher I am, what my teaching beliefs are, and what I want to do together with my students. Beijaard, Verloop & Vermunt's study (2000) showed that the external sources of teachers' professional identity include the ways students treat their teachers and teachers' success in guiding their students. Teachers' views of their own professional identity not only affect their efficacy and professional development, but also their ability and willingness to apply innovative ideas in their teaching practice (Beijaard et al., 2000) to overcome obstacles and employ resources to improve the school, heighten teacher professionalization, and enhance students' learning experiences and effects.

With respect to personal factors, both self-efficacy and interpersonal relationship can affect students' learning outcomes (De Fraja & Landeras, 2006; Lee, Lee & Bong, 2014; Stajkovic & Luthans, 1998). Kinzie, Delcourt and Powers (1994) defined perceived self-efficacy as an individual's confidence in her/his ability that may affect task performances, reflecting her or his confidence in her or his ability to perform the behavior required to achieve specific outcomes. Bandura (1997) proposed that self-efficacy is an individual's belief in her or his competence to achieve success. This belief is an expression of a learner's evaluation of her or his ability in com-

pleting specific behaviors when taking up challenges and tasks. People with high self-efficacy, compared to those with low self-efficacy, have greater chance of success in facing very challenging tasks. Uçar and Sungur (2017) proposed that science self-efficacy is an important factor for predicting science achievements. Lee et al. (2014) also found that learners' self-efficacy shows positive influence on their learning attitude and achievement goals (Stajkovic & Luthans, 1998). Those with high self-efficacy have greater confidence in their learning ability, firmly believing they can complete and actively participate in learning; while those with low self-efficacy are less willing to make attempt, inclining to give up learning (Phillips & Zimmerman, 1990).

Teacher-student relationship and peer relationship are important environmental factors. To students, both teachers and classmates are important psychological pillars, giving them protection psychologically (Mellor, Stokes, Firth, Hayashi, & Cummins, 2008). Ames and Archer (1988) study has found that the learning situation in the classroom will affect students' goal orientation, while friendly peer relationship will render students to adjust their own behaviors and goals through modelling on their peers'. Environmental and psychological stress will be mitigated as a result of teacher-student and peer interactions. When the relationship between psychological needs and environmental stress are in harmony, an individual will come to have a sense of participation and belonging in her/his group, which positively facilitates the learning of students

(Arslan, 2012). De Fraja and Landeras (2006) also pointed out that students' academic achievements will be affected by their peers, self-effort, and the quality of school instruction.

In sum, school environment and teachers' professional identity in environmental factors, and students' self-efficacy and interpersonal factors in personal factors may have positive effects on students' learning outcomes and performances. Thus, this study deduced the following hypotheses:

H₁: School resources and equipment have positive effect on students' learning outcomes.

H₂: Teachers' professional identity has positive effect on students' learning outcomes.

H₃: Students' self-efficacy has positive effect on their learning outcomes.

H₄: Students' interpersonal relationship have positive effect on their learning outcomes.

Research Methods

Research Framework

This study drew on the Ecological Systems Theory as the foundation of its research framework, and employed hierarchical linear modeling for analysis. School environment and teacher identity pertained to the environmental level, while the variables of students' self-efficacy, interpersonal relationship, and learning outcomes were placed under the student level, which formed the research framework of this study, as illustrated in Figure 1.

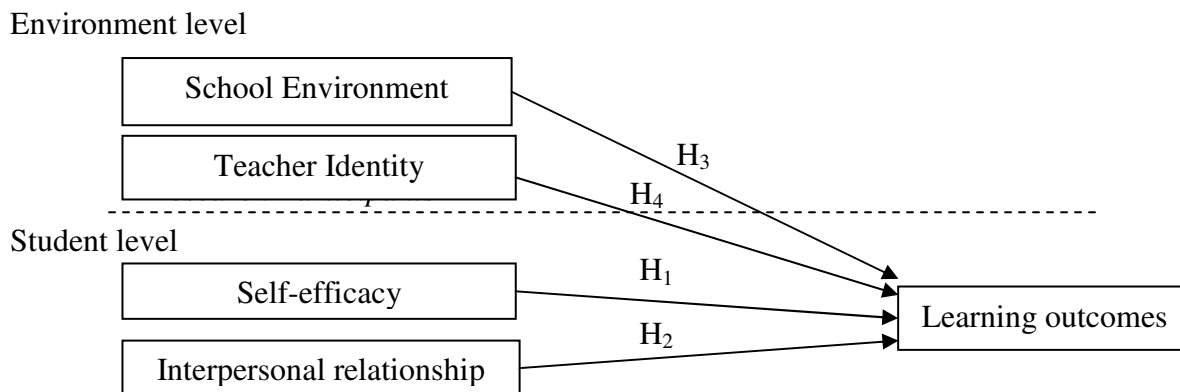


Figure 1. Research model

The research scope of this study was the universities in Hainan, China. Five universities, 45 teachers, and 450 students in the region were selected by means of purposive sampling. The number of effective questionnaires returned were 40 teacher questionnaires and 418 student ones. With respect to the teachers, 17 were male and 23 were female, with 8 possessing a teaching experience under 1 year, 12 from 2 to years, 10 from 6 to 9 years, and 10 over 10 years. As regards the students, 150 were male and 268 were female. 10 years.

Research Instruments

The research tools comprised the school environment scale and teacher identity scale in the teacher questionnaire, and the self-efficacy scale, interpersonal relationship scale, and students' outcomes in the student questionnaire. A confirmatory factor analysis was performed to estimate the construct validity and goodness-of-fit of the various scales.

The environment scale drew on the three sections in Huang's School Environment Scale for Science Teachers (2006), namely, principal leadership, teaching innovation, and resources and equipment. There were 5 questions in relation to principal leadership, whose factor loading in the confirmatory factor analysis ranged from .599 to .895, with its CR=.893, AVE=.629, SRMR=.019>.05, NC=2.08>3, GFI=.981>.90, AGFI=.942>.90, CFI=.976>.90, NFI=.982>.90 all conforming to the goodness-of-fit criteria (Bagozzi & Yi, 1988). There were also 5 questions with respect to teaching inno-

vation, whose factor loading was between .629 and .930, with its CR=.878, AVE=.596, SRMR=.049>.05, NC=4.991>3, GFI=.847>.90, AGFI=.796>.90, CFI=.893>.90, NFI=.862>.90 all conforming to the goodness-of-fit criteria (Bagozzi & Yi, 1988). Likewise, for resources and equipment, there were 5 questions as well. Question 4 was eventually deleted because its factor loading in the confirmatory analysis was larger than 1. The resulting factor loading after removing this question fell between .514 and .944, with its CR=.814, AVE=.534, SRMR=.051>.05, NC=3.082>3, GFI=.935>.90, AGFI=.792>.90, CFI=.921>.90, NFI=.895>.90 all conforming to the goodness-of-fit criteria (Bagozzi & Yi, 1988).

Teachers' professional identity was measured using Zhang, Hawk, Zhang and Zhao's Teachers' Professional Identity Scale (2016) with 15 questions. Its factor loading was between .504 and .889, with its CR=.958, AVE=.609, SRMR=.057>.05, NC=2.959>3, GFI=.905>.90, AGFI=.841>.90, CFI=.903>.90, and NFI=.898>.90 all in accord with the good-of-fit criteria (Bagozzi & Yi, 1988).

The self-efficacy scale was based on the 10 questions in Scholz, Doña, Sud and Schwarzer's (2002) self-efficacy scale. Its factor loading was between .469 and .817, with its CR=.891, AVE=.495, SRMR=.046>.05, NC=3.790>3, GFI=.926>.90, AGFI=.884>.90, CFI=.926>.90, and NFI=.909>.90 all in accord with the

goodness-of-fit criteria (Bagozzi & Yi, 1988).

Interpersonal relationship was measured using Hsu His-Sen's Interpersonal Relationship Scale (2002), which contained 7 questions. Its factor loading was between .692-.826, with its CR=.903, AVE=.581, SRMR=.052>.05, NC=4.291>3, GFI=.903>.90, AGFI=.817>.90, CFI=.908>.90, NFI=.901>.90 all in accord with the goodness-of-fit criteria (Bagozzi & Yi, 1988).

Research Results

The analysis in this study was performed with hierarchical linear modeling. In performing the HLM analysis, it was necessary to first test whether there was such a cross-hierarchical effect before deciding to proceed with a predictive analysis. When the interclass correlated coefficient (ICC) is greater than 0.59, ICC2 is greater than .50 (James, Demaree, & Wolf, 1993), which represents significant difference in the between-group variance. In this case, it is necessary to consider employing a cross-level statistical analysis. For this reason, the null mode analysis was first carried out.

Null Mode Analysis (Model 1)

Level 1: learning outcomes

$$ij = \beta_{0j} + r_{ij}$$

Level 2: $\beta_{0j} = \gamma_{00} + u_{0j}$

In the results of the null mode analysis (Table 1), the between-group

variance component value was 4.691, which reached the significance level ($\chi^2=38.051 \cdot df=4$) and that of the within-group variance was 11.387. This thus met the need for the existence of between-group and within-group variances of the variables in a hierarchical linear analysis (Gavin & Hofmann, 2002). The interclass correlated coefficient (ICC) was $4.691/(4.691+11.387) = .291$, $ICC2=.876$. Of this, 29.1% came from the school level, while 70.9% from the students, and thus, a cross-level analysis could be carried out.

Relationship between Student Level and Academic Outcomes

The two explanatory variables (self-efficacy and interpersonal relationship) in the individual level (students) were first tested to find out if they would affect students' learning outcomes, as shown in the model below:

Level 1: learning outcomes $ij = \beta_{0j} + \beta_{1j}$
 self-efficacy $ij + \beta_{2j}$ interpersonal relationship $ij + r_{ij}$

Level 2: $\beta_{0j} = \gamma_{00} + \gamma_{01}$ self-efficacy $j + \gamma_{02}$ interpersonal relationship $j + u_{0j}$
 $\beta_{1j} = \gamma_{10} + u_{1j}$
 $\beta_{2j} = \gamma_{20} + u_{2j}$

As seen from Mode 2 in Table 1, both self-efficacy and interpersonal relationship reached the significance level ($\gamma_{01} = 4.709, p < .05; \gamma_{02} = 1.212, p < .05$). This indicated that students' self-efficacy and interpersonal relationship

Table 1. Summary table of multi-level analysis

Model Fixed Model	Model 1		Model 2		Model 3	
	Coefficient	<i>t</i>	Coefficient	<i>t</i>	Coefficient	<i>t</i>
γ_{00}	81.778	40.828***	60.353	10.559***	70.577	6.663*
Self-efficacy γ_{01}			4.709	3.368*		
Interpersonal relationship γ_{02}			1.212	3.541*		
School environment γ_{10}					-8.817	-3.930
Teacher identity γ_{20}					11.450	6.382*
Random effect	Variance	χ^2	Variance	χ^2	Variance	χ^2
τ_{00}	22.008	38.051***	148.849	7.216	6.438	6.790*
τ_{10}			5.894	4.326		
τ_{20}			0.077	0.646		
σ^2	129.677		119.193		129.618	

had positive effects on and predictive power for their academic outcomes. This means that the higher students' self-efficacy is, the better their performance in their academic outcomes is; and the better their interpersonal relationship, the better their learning outcomes are. Thus, the results supported H₁ and H₂ of this study.

Relationship between School Level and Academic

The two explanatory variables (resources and equipment, and teachers' professional identity) in the school level were first tested to find out if they would affect students' learning outcomes, as shown in the model below:

Level 1: learning outcomes $_{ij} = \beta_{0j} + r_{ij}$
 Level 2: $\beta_{0j} = \gamma_{00} + \gamma_{01}$ resources and equipment $_j + \gamma_{02}$ teachers' professional identity $_j + u_{0j}$ As seen from Model 3 in

Table 1, resources and equipment ($\gamma_{01} = -8.817$, $p > .05$) did not reach the significance level, while teacher identity ($\gamma_{02} = 11.450$, $p < .05$) did. This indicated that school resources and equipment had no significant effect on students' academic outcomes, while teachers' professional identity had positive significant effect on their outcomes, suggesting that the higher teachers' professional identity is, the better students' learning outcomes are. Thus, H₃ is not valid, while H₄ is.

Conclusion and Recommendations

This study employed HLM to analyze the effects of the factors at a school environment level and at an individual-level of students on students' learning outcomes in Hainan. Results showed that, while school resources and equipment in school environment factors had no significant effect on student outcomes, teachers' professional identity had a positive effect on their outcomes. This

suggests that whether schools' teaching resources and equipment (books in libraries, computers and information software) are adequate have no direct effect on students' learning outcomes. Teachers' professional identity, on the other hand, has a positive effect, facilitating students' learning outcomes. The reason may be that students come to feel their teachers' teaching enthusiasm and values (Geijsel & Meijers, 2005; Newman, 2000), which elicit their learning motivations and performance, thus helping to improve their outcomes.

At the individual level, students' self-efficacy and interpersonal relationship had a significantly positive effect on their learning outcomes, indicating that if students have the confidence in accepting challenges in learning, and completing the tasks given by their teachers, they will have better performance in their learning outcomes (Lee et al., 2014; Stajkovic & Luthans, 1998). Further, if at school, students can develop good interactive relationship with their teachers and classmates, students will develop a sense of participation and belongingness in school or the classroom. They will thus prefer the atmosphere of learning more, which facilitates their learning outcomes (Arslan, 2012).

Therefore, the universities in Hainan must pay greater attention to teachers' professional identity, and students' self-efficacy and interpersonal relationship. Schools should increase teachers' beliefs in teaching, morality, emotions, and values so that students will see these teachers as their role models; in this way, they will have trust in

their teachers, which will improve their learning outcomes. Schools should also increase students' confidence in their learning performance and ability, encouraging and supporting the students in time. Also, schools should help establish good interactive relationship between teachers and students, so that students will develop a sense of participation in school activities, feeling satisfied and supported, and become interested and motivated to learn. Through this, their learning results will be enhanced.

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