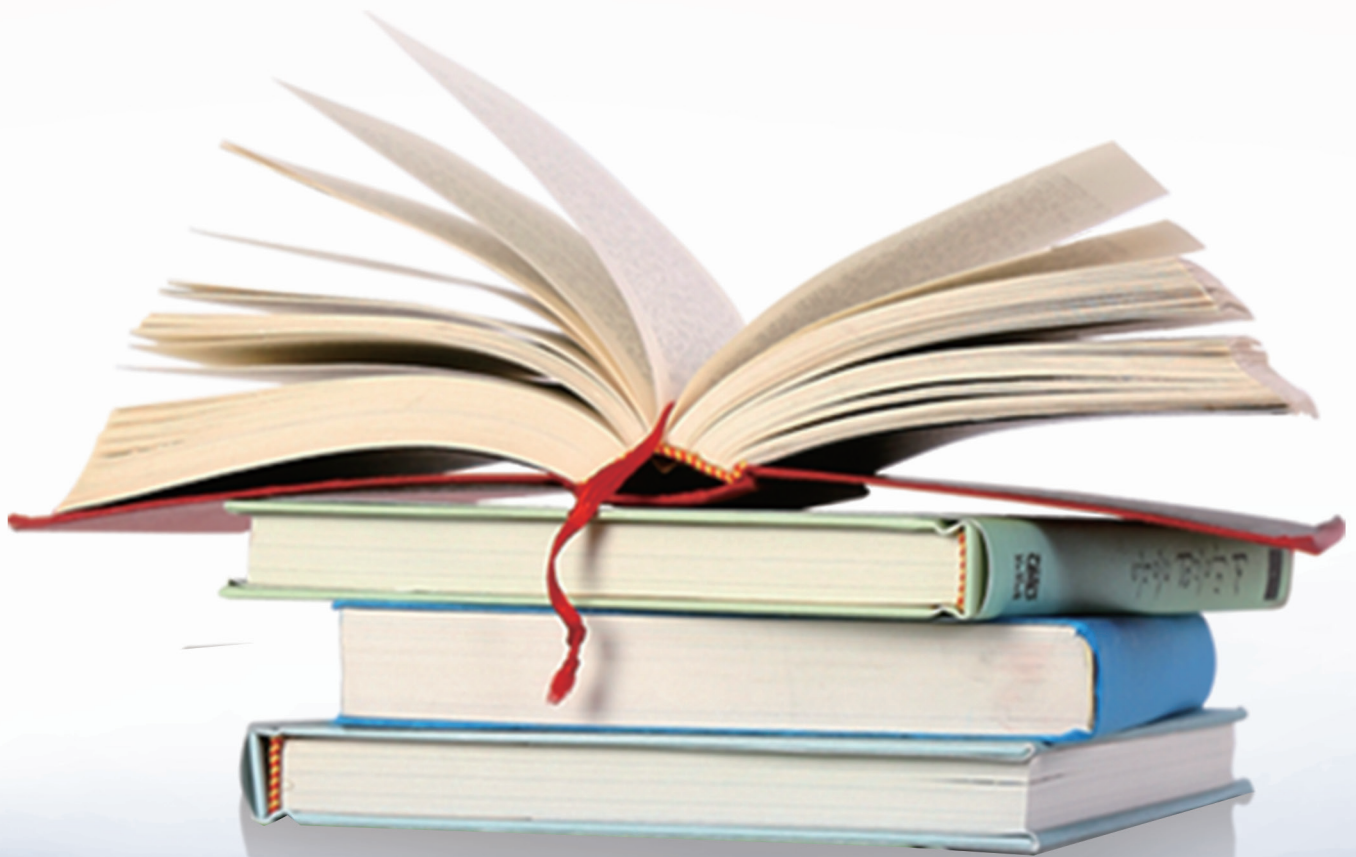




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**Editor-in-Chief**

Dr. Mark David Oursland



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**ARTICLE**

# Outside the Backdoor: Entrepreneurship, Field Experience and Preservice Teachers

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**ABSTRACT**

This research is to share qualitative data of one preservice teacher, and one early childhood entrepreneur, who educated young children in an exclusive outdoor preschool.

The study was conducted in a rural community where most preschools were held in the traditional venue-inside. The Coronavirus-19 pandemic presented many obstacles to the placement of preservice teachers in an appropriate early childhood setting. The university discouraged all direct contact with children. Instead, preservice teachers were expected to view videos of veteran teachers, who in former years, submitted teaching videos to obtain a "National Boards Certification." The objective was that the preservice teachers would "reflect" and learn from the electronic source. This electronic substitution was unacceptable to the researcher. Practicum experiences allow for rich collaboration between preservice teacher and child. Electronic sources can never replicate the rich learning that happens during an authentic face-to face encounter with a child. Thus, the vision for the study was born.

As an alternative to exclusive electronic learning, the preservice university supervisor initiated the opportunity for preservice teachers to participate with a local entrepreneur who was in the process of designing and implementing an exclusive outdoor school. Nature and environmental field experience opportunities for preservice teachers are promising alternatives to the traditional preschool setting. Venues that encourage nature and environmental studies enhance early childhood programs and create opportunities for preservice teachers, and the children they serve, to appreciate the nature around them enhancing their natural curiosity and investigative skills to seek, study, and share. This research article shares the reflections of both the preschool entrepreneur as well as the preservice teacher. It is a pragmatic description of how the exclusive outdoor environment is feasible and presents the challenges and assets that the environmental venue provides.

## 1. What is Outside the Backdoor

The daily routines of young children changed tremendously with the development of the world wide

web, and in recent times with the Covid-19 pandemic. Children no longer spend time playing outdoors. Research by Coates and Pimlott-Wilson (2019),<sup>[4]</sup> indicate that the decline of participation in outdoor play has made a huge

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impact on how young children are educated. With the Coronavirus, multiple hours are spent indoors. Educating children remotely, has eliminated playing with peers, and isolated children to the confines, and seclusion of their homes. According to the Mayo Clinic (2019),<sup>[16]</sup> excessive time spent viewing a screen produces obesity, behavioral issues, academic problems, and impaired attention skills in young children. Ostroff (2020),<sup>[20]</sup> reports that asking her daughter, who was a third grader, what she thought about attending school remotely, resulted in a four-word response, “I miss my friends!” Likewise, Hauck and Felzer-Kim (2019),<sup>[8]</sup> reported that there was a significant increase in delayed motor ability in children two and under who spent a significant time viewing a screen. Researchers Sharkins et al. (2016),<sup>[22]</sup> reported that 130 parents and teachers surveyed, asserted that screen time contributed to the violent behavior demonstrated today. Oswald posited that there is a compelling correlation between excessive screen time, decrease in spending time outdoors, and children with mental health problems. Researchers are finding that too much time indoors looking at a screen leads to children who are not skilled in the art of conversation. In other words, children lack social skills and collaborative skills that are necessary to be successful. Rivkin (1997)<sup>[21]</sup> suggested that institutionalizing children in school and childcare, for a substantial period of the day, has led to the demise of interaction between children and the environment. Moreover, increased crime and the development of high-rise apartments has decreased the availability of open land. A recent study conducted by Larson, et al. (2019),<sup>[13]</sup> documented the amount of time students enrolled in sixth through eighth grades spent using electronic devices. Interestingly, electronic viewing per hour was elevated for females over males. Moreover, African American youth and other racial ethnicities were reported with increased minutes. The highest level of screen time per hour reported was within the eighth-grade population. Video gaming, and compelling social media sites lured students away from spending time in a natural environment. Apart from electronic devices, Martinko (2018),<sup>[17]</sup> believes that parents are hesitant to allow their children to play outside because of safety.

To combat these societal concerns, programs are being initiated to promote outdoor education for all children, regardless of age. Studies have shown that even older children, middle school and beyond, benefit from being outdoors. James and Williams (2017),<sup>[10]</sup> conducted research that included 56 seventh and eighth-grade students who participated in a themed unit focused on water and its’ environmental impact. The series involved lab experiments and field opportunities supported

by environmental scientists. Results of the study indicated that engaging middle schoolers in educational experiences involving nature was beyond beneficial. Students commented that it was a learning experience that would not be forgotten. The teachers involved in the study reflected with comments such as “students were able to apply class-based learning as they participated in actual scientific research and data collection” (p. 66). It is highly likely that such enthusiastic responses could not be replicated through an indoor educational environment. To increase the opportunity for more outdoor experiences, Wilson (2011),<sup>[26]</sup> introduced the concept of “forest kindergartens” which are classrooms conducted primarily outdoors. In the German language these “waldenkindergartens” are uniquely situated in the lush green forests of Bavaria. Wilson further states that these kindergartens are focused differently than some U.S. based early childhood environments. She contends that kindergartens in the United States, have become rigid where environmental learning, and outdoor experiences, have been substituted for teacher directed instruction. However, she posited that the U.S. is slowly changing and mentioned that outdoor schools are becoming more popular in the United States. Her research reported four outdoor schools located in Washington, Oregon and New York that operated in exclusive naturalists’ venues. As posited by Hawxwell (2019),<sup>[19]</sup> teachers are in a unique position to promote a love of nature and the outdoors to their students. An opportunity to provide preservice teachers with the skills to implement outdoor lessons and pedagogy before they establish their own classrooms broaden an awareness and appreciation of what nature and outdoor environments provide.

Maller and Townsend (2006)<sup>[14]</sup> participated in a research design that surveyed 90 school personnel in Australia. The study focused on the implementation of nature-based activities in schools. Sixty percent of the returned surveys, indicated that students who completed studies outside, demonstrated higher levels of positivity, self-confidence, attitude to school, and interpersonal relationships were improved.

Yuan and Lee’s (2016)<sup>[27]</sup> ethnographic study included Ming, a preservice teacher, who reported that his most valuable learning was the direct teaching of an instructor in his primary years. He reported that the teacher:

Led us to a small mountain near our town and taught us about the plants, insects, and birds. This was our biology lesson. Then we went to a small pond and were taught how to swim. This was our P.E. lesson. I think this is the best education I have ever received, p. 827.

Opportunities for preservice teachers to experience



outdoor experiences themselves will only increase the likelihood that they will pass on enthusiasm and preference for outdoor activities to their students. Student teachers in Hawxwell's study (2019),<sup>[9]</sup> reported that; (1) outdoor experiences make the abstract real, (2) practical activities are more memorable, (3) being outdoors motivates students to engage more in the lesson (4) outdoor experiences encourage students to be more creative and (5) the world can suddenly become more obvious and real.

Schwass et al. (2021),<sup>[23]</sup> contends that individuals have difficulty comprehending and appreciating nature when they are not exposed to it. In his research nine individuals experienced one-week journeys spent in outdoor environments. Many of the participants were fearful of living in the wilderness for seven days. They felt threatened by the unknown. For example, one individual was fixated on the concept of grizzly bears and cougars. Others in the group had similar fears. After spending time in the wilderness, seven of the nine individuals voiced that their fear was irrational based on perceived risks rather than actual risks. Marsh (1999)<sup>[15]</sup> suggested that camping encourages physical and cognitive growth of youth between six and twenty-two years old. He reported that younger children develop a positive self-image giving them a stronger personal foundation. He concludes that exposing young children to the environment will strengthen their ability to adjust to changes and adopt healthy living habits. Marsh opined that time spent in the natural environment was positive for all in his study. One participant said that before the journey he spent many hours playing Xbox. When returning to his home, his desire was to be outside appreciating the natural environment. Other participants said that in the future they wanted to share experiences exploring nature with their own children.

According to Cooper (2015),<sup>[5]</sup> daily time spent outdoors benefit young children and meet all developmental guidelines. For example, interacting with nature improves mental stability, self-regulation control, cognitive development, and promotes self-confidence. In his research, one childcare professional mentioned how pleasing it was to "watch children outside overcoming fears of bees, worms, and crickets" p 85.

Simple additions can enhance any outdoor environment. Changes such as adding a looping path or raised flower beds enhance exploration opportunities for young children. Rivkin (1997)<sup>[21]</sup> agrees that natural environments enhance children's development and encourages a love of nature. She suggests starting with small projects such as butterfly gardens, bird feeders,

weather stations and native plants. She posits that adding these will stimulate children's curiosity and enhance outdoor learning opportunities.

Alme and Reime (2021),<sup>[11]</sup> interviewed thirty kindergarten children who were educated primarily in an outdoor setting in Norway. Conclusions from the study indicated that the ambiguity of the natural environment, the changing seasons, and lack of manufactured toys, led to greater creativity and stimulated children's fantasy. For example, when a child was interviewed about playing with a motorcycle, he said that the motorcycle was made of stone and snow. The study concluded that through the natural environment children's ability to structure their own meaning and space was evident.

When teachers are in brick-and-mortar buildings, with little access to the outside environment, children are ignorant of what's outside the backdoor. According to Strickland (2002),<sup>[24]</sup> creating educational opportunities for young children will enhance cognitive development, as well as social competence. A study by Meinen et al. (2012),<sup>[18]</sup> involved 801 students who were enrolled in a gardening project entitled "*Got Dirt.*" Participants were randomly selected from 28 separate schools. Results indicated that there were statistically significant changes in children's desire to: (1) try new fruit, (2) choose fruit or vegetables in place of chips or candy and (3) choose to eat more fruits and vegetables.

To investigate the relationship between self-efficacy and the confidence to teach specific science studies, Al Sultan (2020),<sup>[2]</sup> surveyed fifty-five preservice teachers (elementary) to investigate confidence levels with teaching science concepts. The results of the research suggested that preservice elementary teachers lack confidence teaching a specific science concept such as biology, earth science, physics, or chemistry.

Carrier (2009),<sup>[3]</sup> asserts that allowing preservice teachers to teach in authentic natural environments increases their confidence and self-efficacy. For example, her study included preservice teachers who taught science with community partners (Forest Ecology Preserves Summer Camp). Some of the preservice teachers were hesitant to participate at a venue they had not experienced. They indicated that an outdoor setting was uncomfortable because they were unsure about their ability to teach in a non-traditional classroom. One individual expressed doubts. She thought teaching in the outdoor environment would be a "waste of time" because it was not a "classroom experience." Another preservice teacher said, "it was thrilling to see young kids excited about nature and yearning to learn more" p. 41.

## 2. Purpose of Research

To promote outdoor schools and a focus on nature, it was the desire of a Pacific Northwest University to intentionally provide preservice teachers with field experiences where outdoor environments were encouraged and promoted. As previously stated, outdoor schools are gaining in popularity. However, exclusive outdoor environments for young children are limited.

To create field experiences for preservice teachers at new and non-traditional sites, several new initiatives were launched at the university. Among them was the concept of “third space” as introduced by Zeichner (2010).<sup>[28]</sup> He suggested that there was a gap between what preservice teachers were learning in core university courses, and what occurred in a P-12 classroom. He developed the concept of “third space” where collaboration was the focus between university professors, preservice teachers, and P-12 teachers. To enable preservice teachers to interact with “real children in authentic settings” the university implemented changes to their course requirements that focused on elementary and early childhood preservice teachers. The changes to the program required that preservice teachers participate in local schools in a variety of ways at the beginning of their program and throughout the course sequence.

Previously, the teachers did not fully engage with children in the classroom until the end of their program. By making some significant alterations, the door was opened for preservice teachers to implement pedagogy gained in course work immediately. No longer did preservice teachers need to wait for certification to put theory into practice. Changes included placing preservice teachers in local schools in a support capacity such as supervising the playground or cafeteria. The preservice teachers were given the opportunity to absorb and reflect on effective pedagogy, as they watched and listened. As they progressed, they became more competent and participated in further experiences such as working one-to-one with students in reading, writing and arithmetic.

The early childhood major emphasized settings birth to eight-years of age. As part of the initial core of the early childhood major a practicum opportunity was required the quarter prior to student teaching. Although the early childhood major supported authentic experiences in the classroom, the practice of placement had been solely in traditional early childhood settings. It was the desire of the professors to provide more non-traditional early childhood field experiences.

## 3. Method

The following research demonstrates qualitative

research. According to Jamshed (2014)<sup>[11]</sup> the most common forms of qualitative data are interviews and observations. DiCicco-Bloom and Crabtree (2006)<sup>[6]</sup> suggest that interviewing is a method where the interviewee is giving context and meaning to the data obtained through observations and conversation. The main purpose of interviews and observation is to place the researcher in the nucleus of the data. In other words, the researcher is present, at the venue and time that the data is being demonstrated. Through interviews the researcher can gain knowledge and perspective from the interviewee. The researcher can observe body language and hear fluctuations in voice tone. According to Johnstone (2017)<sup>[12]</sup> vocal tone is a significant and accurate indicator of emotion. For example, an individual’s vocal tone may waver from the baseline in up to 95 percent when not being truthful. As many have experienced, situations where conversations turn into debates will often be loud with voice tone rising until the participants are exasperated and are no longer listening to each other.

This study is based on a preservice teacher who participated in a ten-week practicum, serving in a preschool venue conducted exclusively outdoors. With a qualitative focus the data focuses on both the preservice teacher and preschool entrepreneur, gathering data through observation and personal interviews. Data includes reflections of both participants, as well as the structure and organization of how to educate young children in a natural environment.

This research was conducted through interviews and observations with one preservice teacher and the entrepreneur (owner of the outdoor preschool). Two interviews were held. The first was with the entrepreneur. The second was with the preservice teacher.

The interviews consisted of open-ended questions which were different for each participant. The questions directed towards the preservice teacher were: (1) when did you start the outdoor school, and why (2) what is the structure and daily routine of the outdoor school and (3) what are the requirements of children who attend the outdoor school?

The questions that were specifically addressed to the preservice teacher were: (1) how has this experience prepared you for teaching (2) has this experience enhanced your confidence and increased your skills in pedagogy and (3) what was the greatest lesson learned during this field experience?

The interviews were conducted at the preschool when there were no children present. Both interviews were completed separately. Both were recorded, transcribed, and qualitatively analyzed focusing on similar key words and themes that were present in both conversations.



### 3.1 Participants

The participants involved two adults, one female experienced teacher (certified) with 17 years teaching experience in early childhood settings. The second participant was a preservice teacher who was a senior at a university located in the Pacific Northwest. The preservice teacher was a senior majoring in early childhood education.

### 3.2 Research Design

The research was a qualitative study involving open-ended interviews and observations. Interviews were casual, and informal. Each participant was interviewed separately. Respondents' answers were recorded and transcribed by the researcher. Common threads were analyzed and compared.

Enthusiasm was the main theme that emerged from both participants in the study. As questions were asked, each person responded with positive hand gestures, voice inflection and an excited attitude. The first question that was directed towards the entrepreneur involved the vision for the outdoor school.

### 3.3 Outdoor School Vision

The vision for the school was started one year prior to the outbreak of the Coronavirus 2019. The entrepreneur opened the outdoor school three days a week for four-and five-year-old children. At the same time, she continued her indoor preschool with the established schedule of operating five days per week. Traditionally the entrepreneur taught according to "themes." She believed that a focus on what the children experienced in everyday life was more effective than "push down" curriculum being promoted in the local public schools. She agreed to the position statement of the National Association for the Education of Young Children (2020)<sup>[19]</sup> that curriculum for young children must be culturally, linguistically and ability appropriate. She believed that "following the child" was the best way to teach them. According to Thompson and Ramirez (2021)<sup>[25]</sup> following the child uses observation and data collection to understand the child. Using age, individual development, and culture as a determinant in choosing curriculum the entrepreneur was able to craft learning targets for the outdoor school lessons. She was specifically interested in activities that integrated science, technology, engineering, and mathematics (STEM). According to Gerde, et.al (2013)<sup>[7]</sup> children who engage in scientific exploration in the early years function at higher levels in math, reading, and writing when compared with peers who have limited

exposure to science. The entrepreneur's intention was to provide lessons focused on scientific principals which would build a solid foundation in language learning, literacy, and mathematics development. She outlined possible themes at the beginning of the school year but wanted flexibility to allow for choice and the diverse paths of learning that individual children followed.

### 3.4 Implementation

To promote the vision of an outdoor school a parent letter was developed and sent electronically to all the families who were enrolled in the traditional preschool. Only the parents of the four and five-year-old children were sent an invitation to enroll in the outdoor school. The entrepreneur voiced that three-year-old children would be challenging to include in the first year of implementation. The parents who were interested attended an evening meeting to discuss the very strict "outdoor gear" that the children were required to have. Photographs were placed in a newsletter of a child dressed in the season attire and sent out to the families. The enrollment in the exclusively outdoor school filled immediately doubling the revenue generated by the preschool.

### 3.5 Structure

The outdoor school was theme based with nature foci such as (1) frog life cycle, (2) leaves and trees (3) pumpkins, (4) nocturnal animals, (5) seasons and weather, (6) native habitats with native plants and native species, (7) recycling and (8) ponds and water. During the pond and water unit the stream behind the outdoor school was the perfect place to collect samples. The children directed their own learning. When one child discovered a tadpole, the teacher was able to expand that finding to the life cycle of a frog. The children described their observations as the tadpole evolved, ask questions, and make predictions on what was happening and inferring what might happen next. They learned how to use the scientific inquiry process of observing, asking questions, generating a hypothesis, and recording the data.

To add to their language development, they were able to report on their data through drawings presented to their peers and family members. When the unit for leaves and trees was initiated, the children went on a hunt to find as many different leaves as possible. From their findings they broadened their mathematical skills by sorting and classifying their leaves and deciding which trees they came from. They were able to build vocabulary by learning about a variety of trees. Pumpkins was a target objective after they visited the Pumpkin Patch at a local

farm. After the children had visited the pumpkin patch, they were excited to create their own experience. The children made signs, created a cash register, created a “pumpkin weigher”, and created a strict rule for peers to wait in a line to weigh and pay for their pumpkins. The pumpkin study was project based and entirely initiated by the children. The entrepreneur beamed when she reflected on the event reminiscing on the leadership and learning that solely was child led. She commented, “It is amazing what a field trip can do to create and spark the imagination of a four or five-year-old. Given opportunity they create their own learning adventures.” Nocturnal animals were popular when the children discovered animal prints after the first snowfall of the season. They noticed two different types of prints and used technology, i.e., the teachers’ cell phones to investigate the type of animals that might be lurking at night. They learned the word nocturnal and were pleased when they discovered that a raccoon and a deer had visited their school. That information led to more questions about the animals and their sleep schedules, what they like to eat, and why they do not come out when the children are present. Seasons and weather were a spontaneous interest because of the inconsistency in the weather, especially in the Spring. That inconsistency led to technology which helped them make informed decisions about what the weather of the day would be.

Tread Lightly



Interest was also generated to their parents who gathered donations and purchased an outdoor wireless weather station for them. That led to the collection of more data through entries in their science journals of daily

temperature and drawings of windy, cloudy, sunny, or rainy. Native habitats and species evolved after a special guest speaker from the Department of Fish and Wildlife visited and took them on a treasure hunt to look for birds, animal tracks, and animal homes tucked into the trees.

Observation



Recycling was introduced after their guest speaker pointed out that birds and animals choke on plastic bags and soda bottles that are littered in the forest. The children were appalled that anyone would want to harm an animal. That led to an intense crusade about the evils of littering and led to the addition of recycling bins placed strategically around the preschool. Through the recycling theme, the children learned about being good stewards of the earth and increased vocabulary and language abilities by giving speeches promoting recycling to their parents at an end of the year event.

Outdoor Adventures



### 3.6 Routine of the Outdoor School

The students arrive in staggered fashion and are given the opportunity to observe “nature centers” where a



variety of specimens are displayed along with writing and drawing tools. The children observe and then record data much like a professional scientist. The daily routine starts with “nature yoga”. Stretching, straddling, and strengthening, to encourage endurance flexibility, causing endorphins to embolden the day with positivity. Next, transitioning to listen to the official weather forecaster, prepares students for the temperature, and what to expect from the sky. Weather reports are based on specialized scientific instruments that had been donated to the school. Small group activities center on using natural objects such as leaves, twigs, rocks to launch concepts in math, reading, writing, and science. The children have access to “science blocks” where they can store and observe their treasures. Science blocks with plexi-glass windows allow the children to keep their findings safe and give opportunity to observe and record data in scientific and precise fashion. The entrepreneur reflected that “young children need time to watch, listen, and explore their surroundings. Too much structure disables them and hinders their imagination and need to engage in their surroundings and to explore freely.”

Multiple opportunities are given for exploratory play and gross motor activities. Fine motor development is initiated through exploratory play through sensory mediums such as, mud, sand, grass, hay etc. Dramatic play is extended through activities such as the weighing of pumpkins, nature hunts for specific objects, and “I spy activities”. Gross motor includes hikes, and the ability to use outdoor particles, and objects such as snow to make volcanos. Occasionally, special guests are invited including personnel from the Department of Natural Resources who give presentations on animal footprints, animals indigenous to the area, and identifying a specific animal through clues such as “scat.”

### **3.7 Weather**

When questioned about inclement weather, the entrepreneur said, “it is never too inclement to be outside.” She indicated that the children were dressed so appropriately that no changes were made with the venue. A propane heater was available, but she said that they had never used it. She joyfully concluded that “the children are so active, and so involved that the most boisterous complaint is that they are too hot.” Her concluding remarks were “when kids are leaders of their own learning and given the opportunity to explore the world around them, the possibilities are endless.” Additionally, a small three wall enclosure was added to the property with tree stumps for chairs to accommodate for severe winds that are typically experienced in the Spring. Toileting facilities

are also considered. The entrepreneur giggled when she said, “the bathroom is accessed through the main preschool but sometimes the boys use the “nature potty” that surround all of us.

### **3.8 Preservice Teacher**

The preservice teacher answered three questions: (1) how has this experience prepared you for teaching (2) has this experience enhanced your confidence and increased your skills in pedagogy and (3) what was the greatest lesson learned during this field experience?

In answering the first question concerning how the experience helped her teaching abilities, she asserted that she was more confident teaching in an outdoor setting. She said, “I was fearful because I thought the kids might be out of control.” She went further to express that the preschoolers were so involved in their creations and discoveries that they did not have time to be distracted. She reported that part of the success was that there were so many new things to explore. She posited that “the changing weather added new elements that weren’t there the day before.”

The second question focused on her sense of self-efficacy and confidence. She posited that:

“Being face-to-face with the children before student teaching built my sense of confidence and my ability to be successful with my teaching. This experience was just what I needed. When my peers sat in front of computers watching teachers teach, I was teaching. Nothing can replace a face-to-face experience with kids. This experience really helped me feel more prepared because I got to work with the kids in person. I was nervous that I wouldn’t get this field experience before I started student-teaching, but now I feel much more comfortable.”

The last question involved reflection on the greatest lesson learned from the experience.

She paused and reflected before saying, “adaptation.” She reported that working with young children will always be full of surprise. “They can’t sit for very long, so if something is not working, you must adapt, change and move on.”

## **4. Conclusion**

Every research study has limitations, and this study is no exception. Because this research was conducted in a rural community with a low population only one exclusively outdoor school existed. This research was conducted in 2020 after the outbreak of the Pandemic, creating multiple challenges. Some of the first challenges involved obtaining permission with the university to

conduct the research. Coronavirus-19 brought out the bold voices of politicians who were hesitant to allow citizens to interact with anyone other than immediate family members. Multiple letters were written to the university president, college chair, and department chair to obtain permission to conduct the study. Other challenges involved the mandate of masking. Children who attended the preschool were masked and distanced. This was a difficult mandate to follow with preschool age children. Because the venue of study was exclusively outdoors, the mandate was flexible which made the research more authentic as well as enjoyable for all participants. Imagine being a four-year-old looking for mushrooms in a lush forest with a mask on.

Because of the Coronavirus preservice teachers were hesitant to work directly with children in a face-to-face setting. The preservice teacher involved in this study showed flexibility in taking a risk into an area of controversy. As stated in her comments, the risk that she took in participation was rewarded with a renewed sense of self-efficacy and confidence. As stated above, working directly with children can never be replaced by watching a video. Because the preservice teacher took risks, she was able to experience an exclusive outdoor school with an amazing and enthusiastic entrepreneur with 17 years of teaching experience. The success was beyond measure, and it is the hope of the researcher that outdoor schools become more of the norm than the exception. The university also gained insight into non-traditional preschool venues. Programs that encourage nature and environmental studies are promising alternatives to excessive electronic viewing such as social media, video games, or television. Replacements that encourage nature and environmental studies will enhance early childhood programs and create opportunities for children to appreciate the nature around them to spark their natural instincts to ask questions, investigate, and record.

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**ARTICLE**

# Internal and External Consciousness of Japanese Students' Intercultural Language Communication

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**ABSTRACT**

Japanese strictly distinguish between inside and outside, that is, they have a strong sense of inside and outside. The character has penetrated the study and life of Japanese students. Living in a different cultural environment, Japanese students are more influenced by Internal and External Consciousness in cross-cultural communication. The purpose is to draw out the influence of Internal and External Consciousness on the intercultural communication of Japanese students and put forward targeted teaching strategies accordingly by listing the misunderstandings among Japanese students in intercultural communication through the HSK dynamic corpus of Beijing Language and Culture University.

## 1. Introduction

Internal and External Consciousness is the most representative consciousness in Japanese national consciousness, which refers to the psychological distance between Japanese and communicators. Inside refers to the interpersonal range close to the psychological distance, and outside refers to the interpersonal range far away from the psychological distance, showing respect and estrangement for the outside, and friendship and being free for the Inside. The reason is the habits of life and behavior from childhood. Most Japanese parents do not care about their children's lives as much as Chinese parents do, they take care of their children's food, clothing, housing, and transportation from an early age. Japanese parents are less dependent on their children even when they are older; as children grow up, they leave their parents to live alone, and over time they develop a unique sense of

Internal and External Consciousness in Japanese culture. When Japanese students come to China for cross-cultural communication, there are a lot of inexplicable behaviors, this is because they have been brought up with the concept of not causing trouble to others, namely Internal and External Consciousness. Studying the influence of Internal and External Consciousness on Japanese students' intercultural communication is helpful to understand the cultural psychology and national characteristics behind the unique communicative behavior of Japanese students, and solve the resulting errors and problems from the root. So how to improve Japanese students' intercultural communication ability and enhancing their communicative confidence has become an important aspect of Chinese teaching in Japan.

The concept of intercultural communication, such as Edward Hall, in the language of the silent language, refers to the people from different cultures and customs in the

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process of cross-cultural communication. In the field of second language acquisition it has a great impact and is divided into two dimensions, verbal communication and nonverbal communication in daily communication in the face of the effects of language communication behavior is more common (Mogi, 2001).<sup>[5]</sup> Han Haiyan pointed out that cross-cultural language communication ability is not innate, but needs to be acquired, specifically divided into cultural expression ability of language, cultural cognition ability of language, cultural perception ability of language, and cultural thinking ability of language (Ma, 2015).<sup>[4]</sup>

The cultural cognitive ability of language refers to the cultural understanding ability that Japanese students need to master in terms of communicative competence, including understanding the Chinese economy, politics, culture, and social consciousness.

The cultural expressive power of language ability refers to the ability to use language correctly and truthfully in cross-cultural language communication.

The cultural thinking ability of language refers to the ability of both parties to analyze the causes of communication failure and solve them in a targeted way when encountering problems in cross-cultural communication.

Regarding the cultural perception of language ability in cross-cultural communication, we should always respect each other's national cultures instead of comparing the advantages and disadvantages of cultures by ourselves. Maintaining the cultural identity of both sides is the premise and beginning of establishing a good communication relationship.

For Japanese students who come to China to learn Chinese, it is very important to correctly handle the intercultural communication strategy and master intercultural communication ability. Since intercultural communication competence is influenced by the cultural background of the learner's mother tongue and the way of life (Internal and External Consciousness), studying the influence of cultural awareness on the intercultural communication competence and strategies of Japanese students has become a research hot spot in the field of second language acquisition and intercultural communication.

## **2. Studying Internal and External Consciousness of Japanese Students' Intercultural Communication**

In Japanese culture, social position and age are no longer the primary factors that constitute the "intra-relationship" of the group anymore. Once we start making contact with the outside world, then Internal and External Consciousness will soon surpass the above

factors and become the main factor affecting intercultural communication strategy. In recent years many scholars begin to pay close attention to this problem, and the impact on the Internal and External Consciousness of Japanese students. This work on the current situation of cross-cultural communication and analysis on what causes learners of Chinese as a foreign language "culture shock" is the reasons we puts forward the corresponding strategy for better training cross-cultural communication talents in Japanese Chinese education.

In terms of social culture, Li Yuanyuan believes that Japan belongs to a high-contact culture, where people rely on close interpersonal relations, that is, communication and information transmission through internal and external differentiation. This tendency is especially pronounced when using negative expressions. Faced with the invitation or request of "outsiders", Japanese students will sacrifice themselves to achieve harmony to avoid the embarrassment of "outsiders" being rejected (Davies & Ikeno, 2011).<sup>[2]</sup> In terms of behavior and habits, Li Fugui believes that Japanese students, on the one hand, call the small social group they belong to Inside, and they are very close to the people on the Inside, so they can get along with each other and communicate with each other easily. On the other hand, the outside of the people, students will not communicate as closely as with the Inside people, but adopt a distant, indifferent attitude (Kamada, 1993).<sup>[3]</sup>

In terms of the communicative environment, Japanese culture is very implicit and different from inside and outside, which is a very typically strong communicative environment culture. But, with the prevalence of European and American culture, the culture of a strong communication environment is gradually transformed into weak communication environment culture. Due to the influence of Internal and External Consciousness, some Japanese students have ambiguous characteristics in Chinese expression. Therefore, Chinese teachers should know more about the national character of Japanese students and establish a good teacher-student relationship with them. In terms of national consciousness, the self-centered narrative from things Japanese perspective view and points out that this is because the Japanese culture's Internal and External Consciousness influenced their language communication, the study of Japanese students in China also has a strong sense of ideology and affinity for others both national character traits (Bachnik, 1992).<sup>[1]</sup>

In conclusion, in terms of society, culture, national consciousness, and behaviour habits; Internal and External Consciousness has different degrees of influence on Japanese students' intercultural communication. However,

few scholars have conducted in-depth research on cross-cultural language communication. So this paper will be based on Beijing Language and Culture University HSK dynamic corpus to analyze and summarize the influence of Internal and External Consciousness on Japanese students, and puts forward some targeted teaching strategies.

### **3. The Embodiment of Internal and External Consciousness in Intercultural Communication Behavior**

The study of Internal and External Consciousness is very important for Chinese teaching in Japan and the following analysis will focus on Japanese students most prone to errors: Analysis will include Address forms, Honorific, Phatic communion, and negative representations.

#### **3.1 Address Forms**

Address forms can directly reflect the social relationship and status between communicators. In most cases, the salutation is the first message delivered to the communicator. The choice of address style in conversation is a necessary condition for smooth communication, while inappropriate address style will also cause problems in the communication process. When Japanese students acquire Chinese address terms, they will subconsciously choose according to their Internal and External Consciousness, which leads to the misuse of address terms and causing discomfort and even culture shock, which will affect future communication.

Case 1. My wife's parents are coming tonight, so I must go home early.

Case 2. If I am admitted, please let me know. I will be very grateful.

First, Japanese students' use of address terms is influenced by "psychological distance" and other factors. As in case 1, Japanese students mistakenly refer to their wives' parents as "parents". Chinese refer to their wives' parents as "in-laws" "mother-in-law" "father-in-law" and "mother-in-law". Japanese students, on the other hand, deliberately chose a different address form. This is because Japanese students consider their wives' parents to be psychologically distant from them and do not use such terms as "father and mother," so they choose such terms as "parents" in their communication. In this case, communicators can only ensure the smooth progress of communication by accurately judging the communication situation and the address forms and cultural connotations

and choosing the title accordingly.

Secondly, when some Japanese students come to China for the first time to learn Chinese, they are often confused by the misuse of complex address forms. This is not only related to the negative transfer of the target language, but also the proximity principle in Japanese culture. This is due to the negative transfer of the target language, but the root cause is the proximity principle of Japanese culture. When addressing Japanese usually follow the communicative principles of "respect outside and welcome inside" and "distinguish between internal and external". Specifically, when interacting with "external", use respectful, inside-out addressing strategies, while when interacting with "internal", the attitude will become relaxed and casual, As in case 3, Japanese abuse self-effacing words like "I" when confronted by interviewers because they believe they are psychologically alienated. Therefore, when Japanese students acquire Chinese address forms, they will have cultural cognitive barriers.

#### **3.2 Honorific**

In China, honorifics are used to show respect and love for the communicator. People often judge the use of honorifics based on the closeness or relationship between superiors and subordinates. However, Japanese students choose Chinese honorifics subjectively according to their Internal and External Consciousness, which also affects their cross-cultural communication. Case 3. Clerks: Could you please inquire about the result of the bid?

Section Chief: Ok, I'll check it for you right away

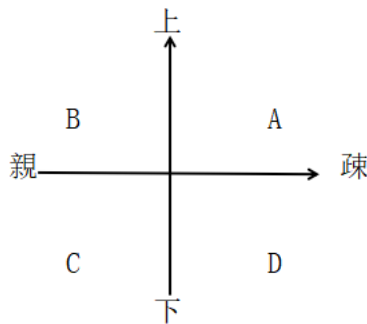
Case 4. Clerks: It's a little bit hot in this room, Mr. Shantian.

Section Chief: Should I turn on the air conditioner?

First of all, Japanese students pay attention to etiquette, forming the characteristics of "modesty, conservatism, formality, and identification. This makes them especially cautious in their communication. Among them, the difference in the use of honorifics shows the most obvious influence of Internal and External Consciousness on Japanese students' communicative behavior. Honorifics are an important part of language communication, and they best reflect the social relations among Japanese, rather than being used in all situations as we might think. As in case 1, When answering the staff's inquiries, the Section Chief is psychologically distant, so he does not use honorifics and answers calmly and distantly, which reflects the communication principle of "superiority" in Japanese society. At the same time, in the process of communication, the Japanese observe the "psychological distance", interpersonal relationship, and social

environment between the communicator and themselves, to judge whether it is necessary to use honorifics to ensure the smooth progress of cross-cultural communication activities. As in case 4, Clerks use honorifics in their daily conversations with the section chief, but the section chief did not respond to the honorific. Japanese students also tend to adopt different “internal and external” communication schemes when communicating with people with different psychological distances. They have different use principles for honorifics to outsiders and insiders.

Secondly, the use of Chinese honorifics by Japanese students is influenced by Internal and External Consciousness and the social and psychological distance from the communicator, rather than just following the objective law of Chinese language expression. In the principle of using honorifics in Chinese, the “superior-subordinate” relationship refers to the use of honorifics by a person of lower status to a person of higher status or the use of honorifics by a person of lower status to a person of older status.” Relationship between close and alienation” is when you use honorifics for people you are distant from, rather than people you are close to. In Chinese, the Japanese usage of Internal and External Consciousness includes the “superior and subordinate” and the “affinity” relationship. As a result, the Internal and External Consciousness network is more complex and often egocentric,” Relationship between close and alienation” and “leader-member relation”, you have to think about both. As shown in figure 3.1, The superior-subordinate relationship is represented on the vertical axis, and the Relationship between close and alienation is represented on the horizontal axis.



**Fig.3.1 illustration of Japanese Internal and External Consciousness**

Fig3.1, A Indicates a superior and close relationship (for example old strangers). At this time, the psychological distance of the Japanese is “extrinsic”. From an honorific point of view, honorifics should be used. B Indicates a

superior and close relationship, (for example our parents). In this case, psychological distance is “intrinsic”, so honorifics are not needed. C Indicates a superior and close relationship (for example our sister). In this case, psychological distance is “extrinsic”, so honorifics are not needed. indicates a superior and close relationship (for example strange children). The distance in the heart is “extrinsic”, and honorifics need to be used. But when it comes to children, the Japanese use more self-deprecation than honorifics out of affection. So, the same is true of language. Influenced by Internal and External Consciousness, the Japanese give priority to internal and external relations before considering the relationship between superior and subordinate or near and far. They choose whether to use honorifics by analyzing the psychological distance between the other party and themselves. When Japanese students acquire Chinese honorifics, they use more honorifics for “outsiders” and fewer honorifics for “insiders”. Therefore, Internal and External Consciousness is the root cause of Japanese students’ problems in using Chinese honorifics, which will affect their language and cultural expression ability.

### 3.3 Phatic Communion

Chinese phatic communion is very rich, most Chinese tend to choose a way of speaking that can shorten the distance between the two sides of communication, while Japanese students will subjectively choose “different internal and external” greetings according to their Internal and External Consciousness when learning Chinese.

Case 5.”Mr. Senior, let’s play basketball together.”

Case 6.

A: This is Tianzhong.May I speak to section chief Zhongtian?

B: This is Shantian Neizi speaking, Waizi(my wife) is out now.

First of all, Japanese students are similar to European and American students in that they say “good morning” and “hello” when they meet andthey also talk about the weather: “What a beautiful day! “How cold it is today! “ “What a hot day it is”. The difference is that when they use the weather-related greetings phatic communion, it can be inferred that most of the people they are greeting are unfamiliar to them. Or for the “outsider” you haven’t seen in a long time. Because it’s not uncommon to say hello to the people inside and then get right to it. As in case 5, Japanese students directly mentioned something in the greeting and invited seniors to play basketball, but in the greeting, mistakenly called “Senior”, Mr. Seniors implying “adults” to indicate the relative distance between



the relationship, because seniors are far away from the speaker. So the relationship between two people may be just ball friends, not familiar. It can be seen that Internal and External Consciousness has a profound impact on Japanese students' intercultural language communication.

Secondly, when the Chinese meet for the first time, to express their intimacy, they often like to ask for some personal information related to each other's life, family, and work to show their attention and concern, but they will also ask for some very honest and in-depth questions. The difference is that Japanese students cannot accept this. Japanese students already classify people they meet for the first time as "outsiders," and it is considered impolite to ask about such personal information unless they bring it up. As in case 5, When a wife receives a call from someone, she does not directly reveal her home, but euphemistically refers to herself as "my wife" and her husband as "husband" to maintain distance from the other person and protect her privacy. Therefore, given the above privacy issues in cross-cultural communication, Japanese students affected by Internal and External Consciousness may express difficulties in understanding communicators, and even suffer from cultural shock, which will affect their linguistic and cultural thinking ability.

### 3.4 Negative Representations

Chinese negative expressions include "no" "can't" "don't" "and so on, words that express rejection or negation can be called negative expressions. Japanese students, when confronted with requests from "outsiders" find the principle of "respecting the outside world" difficult to express; even when they refuse or deny, they tend to choose a euphemistic and implicit way of expression rather than direct rejection, which causes difficulty in their life and communication in China. Case 7: Some people say that "marriage without love is immoral" this sentence is not entirely reasonable.

Case 8: I don't think divorce is at all selfish.

First, Japanese students often fail to use negative expressions correctly and truthfully in communication. When Japanese students express negative opinions in Chinese, they will consciously pay attention to the psychology of the other party, which reflects the "compassion" of the Japanese. They split internally and externally and try to avoid the negative impact of negative answers, thus avoiding embarrassment and embarrassment to each other. As in case 7, in the face of opinions with which they disagree, Japanese students will not deny them directly but adopt a soft way -- "not completely reasonable" to explain their opinions, which not only

expresses their attitude euphemistically but also does not give people a sense of aggression. This is an important factor affecting the consciousness of the negative representation of Japanese students at home and abroad.

Although the Japanese students gave negative answers, their attitudes towards "internal" and "external" members were quite different. As in case 8, When the man filed for divorce, he did not express his views directly, but in a more conciliatory way—"Is not completely" was weaker than "in no shape", It is possible to say no to an insider or family member directly, but it is difficult to say no directly in person to an outsider. Language is the forerunner of culture, and Internal and External Consciousness affects the cultural understanding ability of Japanese students when communicating negative expressions.

## 4. Teaching Strategies for the Influence of Internal and External Consciousness

Cross-cultural communication is the most basic way of communication in the process of communication, which is reflected in four aspects: Listening, speaking, reading, and writing. If you don't pay attention, there will be mistakes and even culture shock. This is inevitable for Japanese students when they are first exposed to a different culture. Therefore, it is necessary to teach Japanese students by their aptitude to help them change the influence of Internal and External Consciousness in cross-cultural language communication. This perspective can help Japanese students quickly master the language, ensure their language usage is semantic, grammatical, and pragmatic accuracy. Therefore, the intercultural communication ability can be improved only through the continuous study and practice of communication discipline, the specific situations are divided into "Cultural cognitive ability of language", "cultural expression ability of language", "cultural thinking ability of language" and "cultural perception ability of language".

### 4.1 Cultural Cognitive Ability Shaping

First, to cultivate students' "language and culture cognition ability", Chinese teachers should promote cultural exchange and comparison. Chinese teachers can integrate cultural exchange and comparison into their daily teaching. Through the comparison of Chinese culture and Japanese culture, Japanese students can better understand the culture of the target language country, learn the authentic Chinese communicative



language, master interpersonal communication distance, and a series of intercultural communication strategies. In addition, there are a wealth of courses and cultural resources on the Internet and teachers can first reasonably integrate these network resources into their lessons and then recommend students to watch these language cultural examples. The most intuitive way to teach culture is through the Internet. Chinese teachers can also guide students to understand the cultural differences between China and Japan through extensive interaction and pen pals on social platforms, To deepen the understanding and understanding of Chinese culture, reduce the influence of Internal and External Consciousness in national culture, promote the improvement of their intercultural communication ability.

#### **4.2 Cultural Expression Ability Training**

To cultivate students' "language and cultural expression ability", Chinese teachers should focus on guiding students to conduct special training in speech skills. Due to the influence of Internal and External Consciousness, Japanese students will inevitably encounter language communication problems such as address forms, honorific, phatic communion, and negative expressions in cross-cultural communication. Japanese students who are exposed to different cultures for the first time are more likely to suffer from communication failure or even culture shock. Therefore, as Chinese teachers, we can train Japanese students in listening, speaking, reading, and writing in Chinese classes to help them improve their "language practice ability" in cross-cultural communication. In class, teachers use the target language -- Chinese to teach, which can create the target language environment, and further exercise the language communication ability of Japanese students, killing two birds with one stone.

#### **4.3 Development of Cultural Thinking Ability**

To cultivate students' "language and cultural thinking ability", Chinese teachers should guide students to create a communicative environment and conduct classroom simulations. Given the influence of Internal and External Consciousness on Japanese students' language communication, Chinese teachers can simulate the situation and occasion of the influence of Internal and External Consciousness, let students group, assign tasks, and use each group or inter-group communication to learn. In this way, they can not only practice and correct

each other in a targeted way but also quickly improve the "thinking ability" of these Japanese students' intercultural communication ability. Chinese teachers encourage students to create a communicative environment and conduct classroom simulations in Chinese classes, which can not only help these Japanese students improve their cultural thinking ability, but also help them better understand the cultural differences between China and Japan in communication, to promote the improvement of cross-cultural communication ability.

#### **4.4 Cultivation of Cultural Perception Ability**

Chinese teachers should reasonably set up practical activities in and out of class to cultivate students' cultural understanding ability of language. Due to the influence of Internal and External Consciousness, the simple explanation of theoretical knowledge cannot improve the intercultural communication ability of Japanese students. Only by improving Japanese students' understanding of Chinese traditional culture and modern civilization can Chinese teachers better resolve the influence of Japanese culture on them. However, to improve the "cultural perception ability" of these Japanese students and avoid inappropriate language communication problems, it is necessary to set up a variety of interesting practical activities to complete, Such as Japanese corner, Chinese corner, etc., students can increase their understanding of the communicator's culture in communication. Extracurricular practice is seen as a big social class, can greatly help students with Japan "consciously" inside and outside influence language communication behavior, also can let them through personal contact with a Chinese friend, learning Chinese social communication strategy, experience Chinese culture society, to correctly treat people, rapidly improve their intercultural communicative competence.

### **5. Conclusion**

The influence of intercultural language communication is mainly reflected in the following aspects: Thinking about and understanding how to express language uses the aspects address forms, honorific, phatic communion, and negative expressions.. Therefore, Chinese teachers should recognize that Japanese students are influenced by Internal and External Consciousness when promoting intercultural language communication, being good at discovering the hidden cultural and national consciousness factors behind the problems will help teachers guide the students with problems. Guiding students to conduct cross-cultural

communication smoothly through teaching of Chinese as a foreign language will promote the healthy development of Chinese teaching in Japan. This paper uses database analysis to explore Japanese students' internal and external awareness and its influence on intercultural language communication. The differences in psychological changes reflected by Japanese students in cross-cultural nonverbal communication will also be one of the topics for future research.

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ARTICLE

## Promoting Patient Problem Solving Using STEM Education Principles

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ABSTRACT

Mathematics teachers know that most of their students are averse to patient problem solving. In this article a new method or perspective for posing engaging problems is explained. This method uses principles of STEM education to enable mathematics teachers to pose relevant real-world problems and facilitate student-initiated explorations that promote patient problem solving. Lessons integrating STEM disciplines expose the students to problems that allow them to naturally apply their knowledge and skills to find a solution. The article includes an explanation of STEM education practices and resources for mathematics teachers.

### 1. Introduction

#### Helping mathematics teachers enable their students to persevere in solving relevant problems through the integration of Science, Technology and Engineering

Would you like students who are more confident and patient in their problem solving? Have you noticed your students are indifferent toward mathematics and are no longer inquisitive? They seem to have lost their desire to understand “why” and get stuck on the formulas and procedures? All 6-12 students can benefit from becoming patient problem solvers; however, stimulating their desire to engage in problem solving is the key. Historically

math teachers and students alike have given their primary focus to performing mathematics procedures in order to complete required course content. Yet teachers also know the benefits of engaging their students in problem solving (NCTM, 1989).<sup>[7]</sup> Every era has dealt with this struggle and technology has been both the solution and challenge in each era. In this article, we provide a new perspective on the dilemma of promoting patient problem solving and while we will focus on teaching mathematics these teaching strategy will work for teachers of any discipline. Our strategy begins by posing an engaging problem (relevant to the students’ interests) and then integrating one of the other STEM disciplines (Science, Engineering, or Technology) to make the problem more relevant. This will help students engage in problem solving and

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integrate what they are learning into the real-world. (Myers, 2015)<sup>[6]</sup>

## **How do STEM Education Principles Help Me Pose Engaging Problems?**

Let us consider why it is so difficult to engage students in patient problem solving. To put it simply, students will not engage in any type of problem solving if they do not want to solve the problem posed. The High School Survey of Students Engagement found 49 percent of students said they were bored in at least one class every day and their main reason for being bored was the material was not interesting (Yazzie-Mintz, 2010).<sup>[10]</sup> If the information presented is not considered interesting, important, or doable the brain will eventually reject it (Marzano, 2011, p. 19).<sup>[4]</sup> Teachers need to create an environment where the students want to solve the problem posed (Schoenfeld, 1989, p. 338-355).<sup>[9]</sup> STEM education addresses this dilemma by suggesting that instruction begins by posing a problem or asking a question based in the students' reality. It is a way of bringing the students' world into the classroom. This is a basic principle of Project/Problem Based Learning (PBL) and instructional methods explained are based on PBL but in a simplified version (Johnson et al., 2020, p. 67).<sup>[3]</sup>

Most teachers have approximately ten minutes each day to plan for tomorrow's lessons; therefore, posing problems that will engage all students is difficult to accomplish. This is where STEM education becomes valuable. By integrating one or more of the other three disciplines of STEM, the teacher can pose more interesting problems and thus engage their students' problem solving. Here is an example that will help reveal the instructional strategy we are suggesting.

## **2. Example from the Classroom**

### **Start With What You Are Presently Doing**

Many years ago, Dr. Andersen, Montana State University, posed an interesting problem to a class of mathematics teachers. "What pup tent arrangement of an 8 by 10 foot tarp will produce a tent with the largest volume?" Over the past 20 years this problem has been posed in geometry, algebra, and calculus courses. Most students are interested in the problem, but they have trouble developing a real understanding of the problem on their own. When students are not patient problem solvers, they stop exploring the problem after about five minutes. They stop short of discovering the multiple arrangements of the tarp to form triangular prisms.

## **Reframing Problems Using Science Inquiry, Engineering Design Processes, or Technology Tools**

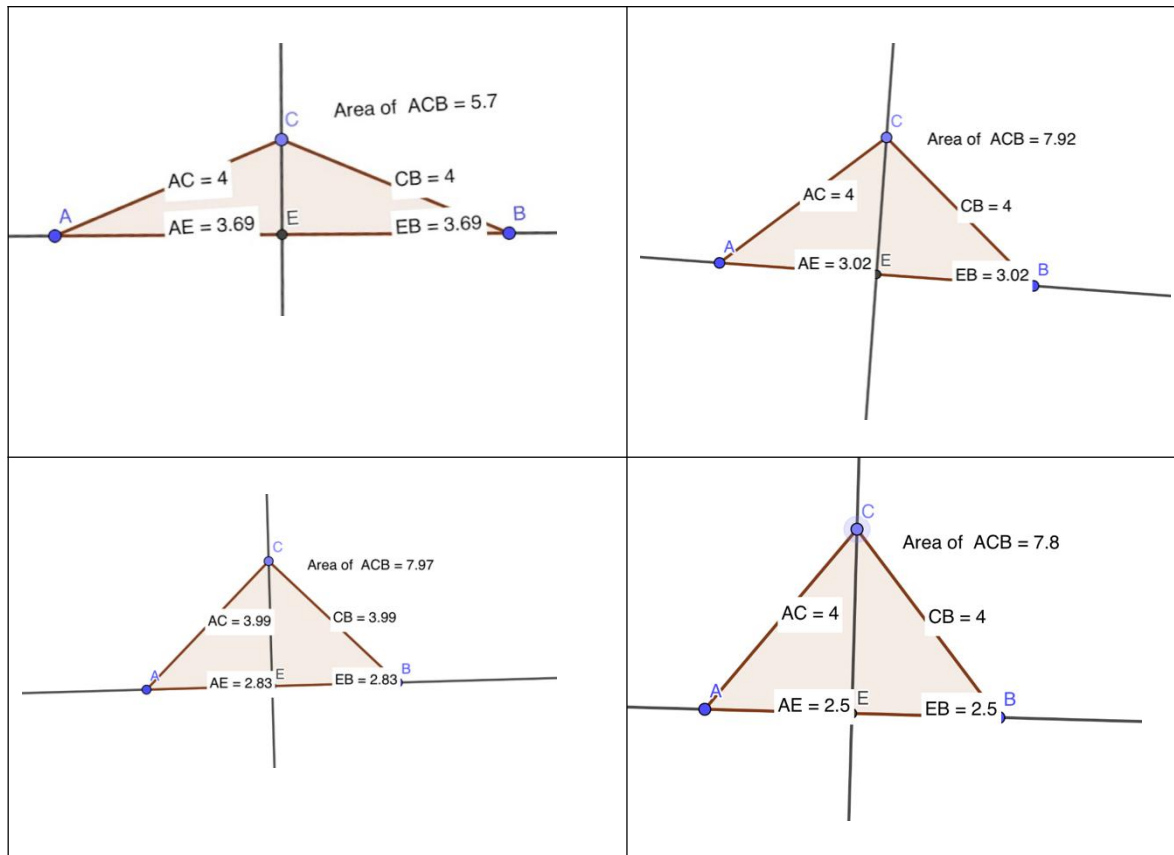
We can improve exploration of this problem by using technology and engineering design processes to motivate students to explore triangular base models of the tent. To model isosceles triangle bases, students will use a free internet accessible geometry modeling application called GeoGebra (GeoGebra, 2020).<sup>[2]</sup> Notice figures 1-3 below, students intuitively designed the dynamic models of the open end of the tent. Students naturally formed iterations of the triangle models, with some guidance, to discover the triangle base with the maximum area. This then allows them to find the maximum volume of the triangular prism by multiplying the maximum triangle area by 8 or 10. The key is to promote exploration of the problem. After students have created a triangle base that fits the constraints of the tarp, they can explore several iterations to find the triangle configuration that will produce the largest volume. In this example, students were using both engineering design processes and a technology tool to explore models of the tent.

### **Model isosceles triangle with legs of 4 or 5 units and use iterations to find the triangle with the maximum area**

From figure 1, the iteration in the lower left has the maximum area of the isosceles triangle which is approximately 8 square units; therefore, the maximum volume of the tent is 80. Some students might not realize that they also need to model an isosceles triangle with sides of 5 and then multiply the maximum area of the triangle by 8 to find the maximum volume of the tent. To promote good mathematics instruction, we will leave which tent arrangement has the greater volume to you the reader. Through the use of questions and peer discussions, the teacher can facilitate missing information and correct any misconceptions.

### **Pose the Problem to Promote Productive Struggle**

Teachers need to adjust the problems to the students' mathematical and problem-solving knowledge. Most of the time teachers have classes where students have a wide range of knowledge and skills; it is therefore important teachers pose problems with a high ceiling and low floor. Use problems that engage everyone to explore the problem, but are challenging enough to require a problem solving strategy. The teachers' perspective must be promoting patient problem solving which requires a productive struggle. Students learn and grow as a patient



GeoGebra figure 1

problem solver by struggling to understand the problem. George Polya said, “A great discovery solves a great problem, but there is a grain of discovery in a solution of any problem. Your problem may be modest, but if it challenges your curiosity and brings into play your inventive faculties, and if you solve it by your own means, you may experience the tension and enjoy the triumph of discovery.” (Polya, 1973, p. v).<sup>[8]</sup> In the tent example, productive struggle is facilitated by engineering design processes and a technology tool. The students could then use their mathematics knowledge to propose strategies for solving the problem. Our initial problem was, “What pup tent arrangement of an 8 by 10 foot tarp will produce a tent with the largest volume?” A suggested improvement to the posed problem might be, “When camping what is the largest volume pup tent possible from an 8 by 10 foot tarp? Use GeoGebra to design the open-end of the pup tent. Then use different configurations of the open-end of the pup tent to find the largest volume tent possible.” Teachers can use STEM education principles such as forming groups to increasing students’ collaboration and communication. Talking through the problem with other students helps all students formulating problem solving

strategies and sift through information and new ideas. As students work toward a solution their discussion will help them develop a deeper understanding of concepts.

### Problems Can Be Reused

A mathematics teacher can reuse a good problem. Problem ideas can be reframed using STEM integrations to challenge students to use a different problem-solving strategy for the same problem. From the students’ perspective, a problem posed using a technological tool is different from a problem posed using a drawing or physical object. The teacher can focus students’ problem exploration by the STEM perspective used to pose the problem. For example, this problem could be used for advanced algebra students that may have already solved this problem previously. For an advanced algebra class, the teacher might suggest modeling with GeoGebra or leaving the triangle modeling up to the students, “When camping what is the largest volume pup tent possible from an 8 by 10 foot tarp? Use DESMOS to find the find the largest volume tent possible from a volume equation.” A free computer application like DESMOS (DESMOS, 2022)<sup>[11]</sup> or graphing calculator can be suggested to



facilitate exploration. Using technology tools is a great strategy to engaging students in problem exploration.

**Students use DESMOS to write an equation for the volume of a triangular prism with the 8x10 foot tarp constraints**

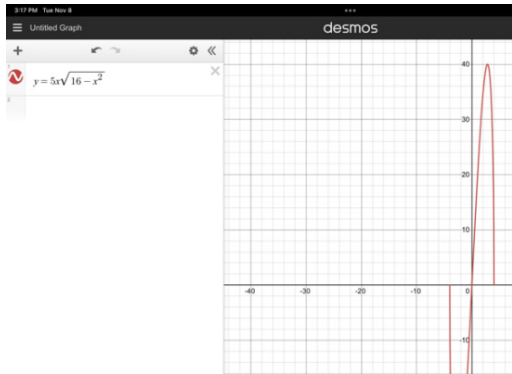


figure 2

**Students will use DESMOS to find the maximum value of the equation which is also the maximum volume of the triangular prism.**

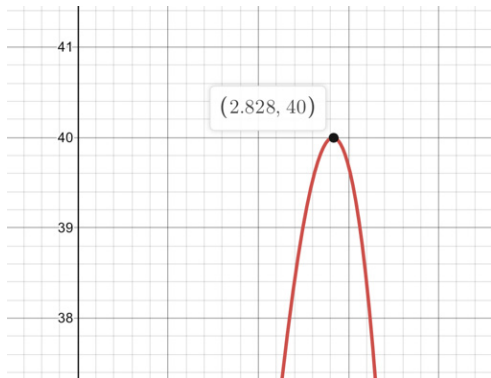


figure 3

When using this algebra approach to this problem there are two important components: First, writing the third-degree polynomial and finding the maximum value of the third-degree polynomial (figure 2). To write the volume equation students must model the isosceles triangular prism, select a dimension of the model for the independent variable. Second, use a mathematical process to find the maximum of the volume function (figure 3). This is another example of how technology can be used as a problem-solving strategy. This equation would be difficult to graph by hand, so being familiar with graphing technology like DESMOS will make enhance your students’ ability to focus on solving a problem like this one. If this problem is posed in a calculus class, students

know the mathematical procedure to find the maximum volume by finding the derivative of the volume equation. Versatile, engaging problems that connect algebra and geometry are difficult to think up or find in a couple minutes, but improving an existing problem from a past lesson or textbook using STEM education principles is possible with practice.

**3. Understanding STEM Disciplines Will Help You Apply the Basic STEM Education Principles**

STEM education is integrating concepts from Science, Technology, Engineering and Math while emphasizing the application of knowledge to real-life situations. Lessons that integrate STEM disciplines expose the students to problems that allow them to naturally apply their knowledge and skills to find a solution. Posing engaging problems through STEM integration can be used by any teacher; however, we are focusing on supporting mathematics teachers. Therefore, the mathematics teacher must seek to understand the essence of science, technology, and engineering. They must learn to integrate skills, knowledge, and pedagogies from these disciplines into their problem-solving lessons. In an effort to help facilitate this integration, we will focus on the STEM literacy for each individual discipline.

**Science Literacy**

The scientific method starts with asking a question about real-world situations and using inquiry (data and observation collection) to investigate the question. According to the AAAS, a scientifically literate person has the thinking skills and science knowledge to use science, technology, engineering, and mathematics processes to answer questions at both a personal and societal level (Johnson et al., 2020, p. 30).<sup>[3]</sup> In other words, our goal is to create students who understand the process of science and can apply scientific concepts.

**Technology Literacy**

Technology is a diverse collection of processes and knowledge that people use to extend human abilities. Technology literacy also includes the skills required to use the technology in a safe and responsible manner. A technologically literate person uses technology to enhance education of other subjects and empower the ability of individuals in our ever-changing technological society. (Johnson et al., 2020, p. 31)<sup>[3]</sup> Therefore, our goal is to improve student’s ability to use digital tools creatively and to communicate more effectively.

## Engineering Literacy

Engineering design process can be used to solve real-world problems through modeling and testing. An engineer will generate several different possible solutions and systematically test and refine them until a final solution is provided. It teaches students to redefine the problem or to generate new solutions. An engineering literate person can use the engineering design process to solve real-world problems by incorporating science, technology and mathematics (Johnson et al., 2020, p. 31)<sup>[3]</sup>

## Mathematical Literacy

Mathematics is about problem solving. Math students need the skills that support the application of mathematics. They need the confidence to think numerically and critically analyze daily situations to solve problems. A mathematically literate person can use mathematical knowledge to apply mathematics in other areas and to their daily lives. (Johnson et al., 2020, p. 32)<sup>[3]</sup>

Becoming a STEM literate educator means that you are asking students to solve problems that cannot be solved using a single discipline. Students are gaining the ability to think critically and communicate effectively. The STEM literate educator can plan lessons that enable their students to solve meaningful and relevant problems.

## 4. Resources and Ideas to Start Posing More Engaging Problems

### Dan Meyer's 3-Acts

Dan Meyer's 3-Acts is a great resource for problems posed using video technology. This resource poses problems using 3-Acts (Meyers, 2022, November 23):<sup>[5]</sup>

Act 1 – pose an engaging problem using a video or picture;

Act 2 – provide information and suggest strategies for students;

Act 3 – reveal a solution using a video or a picture and discuss possible solutions and extensions. There are 83 problems aligned with almost every Common Core State Standard for Mathematics that can be accessed on a Google Drive managed by Dan Meyer. [https://docs.google.com/spreadsheets/d/1jXSt\\_CoDzyDFeJimZxnhgwOVsWkTQEsfqouLWNNC6Z4/edit#gid=0](https://docs.google.com/spreadsheets/d/1jXSt_CoDzyDFeJimZxnhgwOVsWkTQEsfqouLWNNC6Z4/edit#gid=0).

### Some examples we have used in the classroom and recommend would be:

#### Domino Skyscraper

A chain of dominos is set up to fall sequentially. Each domino is 1.5 times larger than the previous domino. The

problem posed is, “How many dominos would it take to knock over a skyscraper?” Students use their knowledge of exponential functions to understand and solve this problem.

#### Meatballs

A cylindrical cooking pot containing sauce is on the stove and meatballs are dropped into the pot. The problem posed is, “How many meatballs can be used before the sauce will overflow the pot?” Students use their knowledge of the volume of a cylinder and a sphere to understand and solve this problem.

#### Sugar Packets

One student is eating sugar packets, while another student is drinking a 20 oz. bottle of soda. The problem posed is, “How many packets of sugar are in a 20 oz. bottle of soda?” Students use proportional reasoning to understand and solve this problem.

Dan Meyer's use of videos and images to present the problems is easy and engaging. Students are drawn in by the visual presentation and the real-world scenarios. After viewing a few of Dan Meyer's problems, teachers could easily create their own using only a cell phone camera.

## Integrate Science – Collect Real World Data

Rather than requiring students to analyze naked numbers (numbers without meaning or unit), mathematics teachers should require students to collect and analyze data about phenomena in their world. This is the focus of science, so when brainstorming how to bring meaning to numbers, mathematics teachers should think about posing a science problem or question. When collecting data, students will struggle with measurement skills and messy data, but the mathematical concepts and skills students will use in analyzing the data are still the same. Students will calculate and discuss mathematical relationships between variables, means, volumes, etc. An example that would engage students of all ages is the bounciness of a ball. Drop a tennis ball from different heights and measure the height of its bounce. You can ask many questions, one I have used is, “How high must you drop a tennis ball from, for its bounce to be 5 feet?” As the teacher you must decide how much support and guidance your students will need. Start by collecting data into tables and use graphing apps to determine whether the relationships between drop height and bounce height are linear or some other function. Bounciness is just one example of an infinite number of investigations that can be performed easily inside or outside a mathematics classroom.

## Engineering Design Process

Engineers solve real-world problems, so if a mathematics teacher changes a textbook or worksheet exercise into a real-world problem, then they are using the engineering design process. You will build a prototype (model) from the constraints of the problem and then use iterations of that model to improve on the prototype. The tent problem used earlier was one example of using engineering to improve a mathematics problem about triangle prisms. Instead of giving your students a worksheet of circumference calculations, ask them this question, “What is the diameter of a tire that rolls (complete revolution) twice as far as a tire with a diameter of 18 inches?” When using engineering problems, make sure you have materials ready so students can explore. In this case, tires from Lego sets, coins, or any round discs will do.

## 5. Getting Started: Try Posing More Engaging Problems

As a mathematics teacher whether you are comfortable teaching problem solving or application of mathematics skills, we all want our students to be more engaged in the activities we plan. We propose starting instruction with an engaging question or problem. This is not easy and is why we have proposed the proven instructional method explained in this article. Use STEM integration to draft an engaging question or problem related to your existing past materials or resources. Use science integration so that students are analyzing numbers that mean something to them. Use technological tools to investigate the world in an authentic manner. Use the engineering design process to solve problems by making and improving real world things.

We encourage you to try this method at least once. Select a single lesson or mini unit where you feel problem solving makes sense or your curriculum is lacking. For a single lesson, the beginning of a unit or the end of a unit is a logical place to pose a question. For example, at the beginning of a statistics unit you could use a survey to collect class data. Then pose a problem related to the data and the statistics procedures taught in the unit. Perhaps you have completed a unit on volume, but the line art problems are not very stimulating. So the video task from the 3-Acts resource like Meatballs could be used to stimulate problem solving. A mini-unit is great when you do not want to start a new unit in the middle of the week. This is when a Project/Problem Based Unit can

be used. Perhaps you could select one of the ideas from this article that you want to use as a review or enrichment exercise. For example, you are finishing the first semester of a geometry course. You would like to review triangles, prisms, and the Pythagorean Theorem—pose the puppet problem explained earlier. Since you have not used GeoGebra before, students should spend a one day becoming familiar with the use of this geometry app. Students then spend two days discussing the problem and constructing geometric figures using GeoGebra. They will be ready to share their strategies and solutions to the tent with the most volume on the end of the third day.

Posing problems before teaching procedures may seem like more than you want to tackle, but we encourage you to try STEM integration in your classroom. We think that you, and your students, will find this process fun and productive.

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ARTICLE

# Incorporation of Media Arts for Chilean Young Students With Special Learning Needs

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ABSTRACT

The present informal study of Information and Communication Technology (ICT) in special education through media arts. There are deep inequalities in the access of new technological opportunities and adaptive user experiences for students with special learning needs. Our goal as teacher educators is to improve enhance autonomous learning using the complementary subject of media arts. This new educational proposal aims to solve the technology usability problems for students with disabilities. The personalized autonomy of students' use technology in school learning is a key strategy for students with disabilities. For this study as with many schools, the technology resources and educational services to implement digital skills and new ICT teaching-learning strategies for the complementary subject of media arts is not available. Finally, implementing these digital skills is an essential part of the educational-labor system for adolescent students with disabilities.

## 1. Introduction

### 1.1. Presentation and Justification of the Problem

This informal study reflects on the impact of the using Information and Communication Technologies (ICT) with adolescents that have different types of disabilities is best done at the time of procurement or development, rather than after a disabled person makes their presence known—an approach that is connected to the construct of universal design, [...].<sup>[1]</sup> For this purpose, there will be a need to implement the mini-workshop activity for job training in graphic design as a pilot (test) for the young students within the special school. However, to begin we must determination access to ICT educational resources and the young students with disabilities ability to use the required computer-based technologies.

The present informal study of ICT in special education through media art reveals deep inequalities of access by special students seeking new opportunities for technological development and improved new adaptive user experience.

This informal study is about the participation of young students with disabilities in ICT supported by the complementary subjects of technological education and art education. Special education involves all social elements; as well as interactive participation and school coherence—of conceptual content, procedures, and attitudes—to favor meaningful learning in the ICT.

### 1.2. What is the Purpose of Complementary Subjects of Technological Education and Art Education?

Despite the skills and development of technological

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learning, it is very different from the approach by students with disabilities. Just as the learning scenario linked to graphic art depends on the context and adaptation of the class activity, the graphic design to configuration used will determine the practice and new tool required.

Just as the development of learning activities and teaching techniques is achievable through various methods of creating and motivating digital design that facilitate more participatory and entertaining experiences.

However, to analyze the task of the research study on the integration of ICT and art. This vision allows us to understand the artistic and technological methodology that is indicated herein:

What is the reason for teaching a complex task of the didactic tools in ICT through art education? How is the interdisciplinary curriculum and teaching based on ICT in the world of the arts properly planned? Where does technology come through media arts? What is it about educational technology in art and its diversity in the virtual classroom? How can I achieve and teach its users as students at the level of strategic learning?<sup>[2]</sup>

Interest in the way art and media representations shape the lives of disabled people is the intersection of two fields of study – disability studies and disability-focused arts, culture, and media studies.<sup>[3]</sup> There is a need to create the capacity for students and teachers in the special schools to implement a new complementary methodology in both ICT and media art, which will be strengthening digital literacy for everyone.

### **1.3. Preliminary Study of ICT Usability**

This preliminary study of ICT usability for young students with disability incorporates the use of a desktop computer, digital tablet, and laptop. It turns out, that it is important to highlight the new technologies applied to special education. Thus, the interdisciplinary methodology of ICT and media art favors the use of technology for young students with disabilities.

However, in this section, we briefly explain some basic ICT tools through art for students in special schools. Each student has a different type of physical, deaf, and intellectual disability. Despite the current subject of Technological Education, it is recognized by the Ministry of Education of Chile to level their needs and desires with the new technologies applied to education.

### **1.4. Role of ICT in the Special School**

As I have explained in the previous section, this study focuses on the synthesis of new technologies for special education and on the role of ICT in this educational context.

Obviously, since the technological application directly

affects those students who make it difficult to adapt the presentation of user interfaces (or adapt the software to the user) special attention will be given to the specific use as the teaching-learning process within the virtual classroom.

It also will be difficult to account for the students with disabilities use of the technologies, unique course attributes, the creative ability of the users, and technology learning strategy used.

Our goal is to improve the need for autonomous learning to enhance the creation and quality of teaching based on the complementary subject of media arts.

## **2. Method**

The new educational proposals are aimed at solving usability problems for students with disabilities. Likewise, this educational stage is a complementary subject, especially to inclusive school users.

### **2.1. Pre-activity Preparation**

To introduce these important educational extensions mini-workshops are for short-term planning (Table 1). Some of the information in the mini-workshops will require prior knowledge of technological applications, but the focus will be a complementary subject of media arts.

Put simply, if teachers understand disability through disabled people's profiles and art, they feel more confident in including such materials in their teaching.<sup>[4]</sup> So, the flexibility of ICT enables art education for disabled students through the use of multimedia tools and graphic software. And each student, it will be able to promote their own work in the creation of visual information.

### **2.2. Participants**

In the special school of the Rigoberta Menchu Educational Corporation of La Pintana, the participants included nine students with different types of disabilities: hearing, physical, and intellectual with ages (average) between 13 and 16 years of age.

### **2.3. Activities**

#### **2.3.1. Experimentation with Digital Photography (Sessions #1 and #2)**

Each student has the freedom to photograph in different positions, reinforcing it with the use of a camera or other device at different points on the ground (or courtyard) inside the school. For example, photography is a creative medium to promote different dialogues, as well as interdisciplinary work (on teaching art and technology). Since, the appearance of the digital camera, and even the

**Table 1. Planning of the Digital Photography Mini-Workshop – Basic Level**

<b>Duration / sessions</b>	1 hour / 4 sessions
<b>Short description</b>	The mini-workshop is aimed at students interested in learning and knowing the practice of digital photography in different media (smartphone, tablet, or camera), providing basic and simple training to enable the acquisition of personal skills, experimental work, and creative images.
<b>Objectives</b>	<ul style="list-style-type: none"> <li>- Train students in the use of operation and management of digital photography in different media.</li> <li>- Train students to express themselves creatively with photographic images in any digital medium through group computers or your own smartphone</li> <li>- Train students to express themselves creatively with photographic images in any digital medium through group computers or your own smartphone.</li> </ul>
<b>Content and sessions</b>	<p>Session #1: Introduction to basic photography and getting to know our digital medium.</p> <p>Session #2: Pre-production in photography and its importance (wide angle, normal, zoom, etc.).</p> <p>Session #3: Production in photography and its basic principles of composition.</p> <p>Session #4: Post-production and editing of images in an installed application and/or a free software.</p>
<b>Methodology</b>	This mini-workshop corresponds to a practical class and free topic, this depends on the use of digital media. Application exercises and practice of content are addressed in the field/patio exit with natural light (sessions #1 and #2) and in the computer lab class (sessions #3 and #4).

Source: Self-made

smartphone basic principles of photography are easier and students can easily express themselves. The photographic exercises facilitate the students with disabilities ability to share their different views of the artistic world.

In each photo (Figure 1 to 4) it can be seen that the young students are playing with the most friendly, creative, and fun photographic experimentation during the workshop.



**Figure 1:** A student is experimenting with the camera on the ground (in the courtyard) during the mini-workshop activity. Source: Own image.



**Figure 2:** (Left) Two students are experimenting with their own smartphones. (Right) Several students are simulating with their own camera apparatus. Source: Own image.



**Figure 3:** (Left) Several students are experimenting with their own smartphones at different points on the ground (in the courtyard). (Right) A student looks at her own digital tablet image. Source: Own image.



**Figure 4:** (Left) An image sample made by a student. (Right) Several groups in different positions of the photograph in the field (inside the school). Source: Own image.

Thus, the photography art connects with students with disabilities in different technical aspects and ideas, strengthening the ability to visualize and express sensitivity, creativity, and personal identity through experimentation in creative photography.



### 2.3.2. Knowing the Use of Photoshop (Sessions #2 and #4)

This computer material is especially aimed at students without basic experience in the usability of tools in Photoshop. This tool works similarly to input effects and image filters. Some tools start at:

- Open, create and save a new Photoshop document;
- Import and edit one or two images;
- Select the gallery of filters;
- Save and export a file in JPG format.

Most of the students are unaware of the programs and interface of this image editing program. Each student should create a new folder with their name (and also the name of the Photoshop document) so they don't lose their archived work. Many students were motivated by the activity about access to computers or other computing devices such as laptops, so the difference of access to the Internet (without the need to be connected or a wireless Wi-Fi interconnection within the school) it moves away from navigation, and although it interrupts the loss of time during the activity of said workshop (Figure 5 to 7).

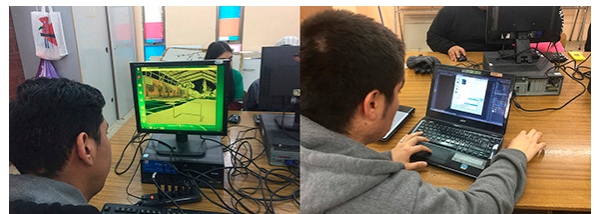


**Figure 5:** (Left) Student groups observe the desktop computer, using the Photoshop program. (Right) A student is grasping his usability of the graphic arts program.

Source: Own image.



**Figure 6:** (Left) A student is designing her own artwork. (Right) A student is observing and collaborating with her classmate through the graphic arts program. Source: Own image.



**Figure 7:** (Left) A student is observing with the image filter. (Right) A student is finishing her personal work. Source: Own image.

Independent with individual/group users with the support of collaborative work, and sharing with the same simple tool, depending on their personalized skill and creativity to work artistically. However, important to socialize good behavior from peers as the future of human relationship within the classroom.

## 3. Results

The complementary subject teaching of art media was facilitated with the autonomy of technological learning for young learners through access to ICT and art. The proposed instruction included both a new level of technology use in school learning and the students' personalized autonomy. Key to the inclusion of the new instruction was the school's motivation to offer the mini-workshop.

Now we will examine the usability of technology by the students as a complementary subject in different general observations about the effectiveness of the artistic tool.

### 3.1. Sample of Final Works

A good example of the work completed by each student (Figure 8 to 11). However, young people in a condition of disability, therefore, have been especially valued and learned the new experience of usability together with the Photoshop program for simple artistic work.



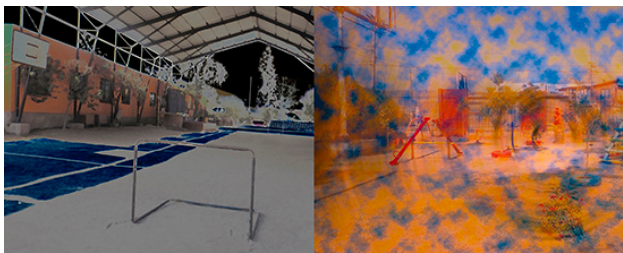
**Figure 8:** Final result of the assessment of different jobs by young students with disabilities from the Rigoberta Menchu Educational Corporation of La Pintana. Source: Own image.



**Figure 9:** Final result of the assessment of different jobs by young students with disabilities from the Rigoberta Menchu Educational Corporation of La Pintana. Source: Own image.



**Figure 10:** Final result of the assessment of different jobs by young students with disabilities from the Rigoberta Menchu Educational Corporation of La Pintana. Source: Own image.



**Figure 11:** Final result of the assessment of different jobs by young students with disabilities from the Rigoberta Menchu Educational Corporation of La Pintana. Source: Own image.

Added to these differences in Internet access between browsers or viruses are greater time losses, different failures in school performance and the low level of learning compared to the motivation, autonomy, and creativity of young students with disabilities. Therefore, it was important to reinforcing the idea of the use of ICT in the complementary subject rather than including Internet access during the activity in the mini-workshop.

#### 4. Discussion

This will involve acknowledging and understanding unfolding concepts, institutions, and realities of disability rights in relation to technology, as a bedrock for charting and addressing digital inequality and inclusion challenges.<sup>[5]</sup>

Currently, that school does not have resources and educational services to implement digital skills and new ICT teaching-learning strategies for the complementary subject of media arts on the special school. It also will even be necessary for adapting the frameworks of professional skills for teacher's duo (or inclusive teaching's duo<sup>①</sup>), and other non-teaching professionals. So, the use and exploitation of technology and art as a

① The inclusive teaching duo corresponds to a capacity for cooperative and collaborative work in interdisciplinary educational programming courses such as the complementary subject plan.

recognized and valued labor-formal practice will need to be integrated into the general training processes of teachers.

#### 4.1. New Proposal of the Practice of Social and Labor Insertion

The purpose of this informal study was to determine if it was feasible to propose complementary instruction of ICT in media arts for young students with disabilities. Challenges include teaching personalized photography before computer use. In an effort to foster inclusion and mobilize access in higher education, digital collaborative making encourages students to work collaboratively on the creation of multimedia projects.<sup>[6]</sup> So, we propose that the methods and techniques of ICT teaching for the complementary subject of media arts are essential assuming the commitment for young students with disabilities. This is how we propose the improvement of our quality of life of education in autonomous learning.

However, ICT in media arts should be thought of as a teaching resource for the development of skills using different learning scenarios. Therefore, each student has a different human capacity through a social-labor construction towards visual communication — visual, advertising, artistic language, and more precise; thus, knowledge based on the exchange of ideas and visual messages such as the use of time and space towards greater flexibility in the learning process and personal autonomy.

So, the contributions of labor training for young people with different types of disabilities to ensure the acquisition of autonomous learning, of course, the skills required for each area or employability profile, and the new experience towards labor inclusion in Chile.

From the impact of new technologies on the labor market to carry out work in better conditions and understand the various natural phenomena that they offer or seek to identify in a better way to live such a useful life. In other words, for all students with disabilities who take advantage of the new opportunities for subsequent generation of technological learning processes for the artistic project and new technologies through visual communication, depending on the area to which they belong.

Another question of complex participation for both formal and non-formal education and also for special education, in both cases accepting the mutual recognition of the completion of different modules of inclusive labor training.

In this sense, the methodology and teaching of the Training Center or other parameters such as an assessment, validation, or accreditation of key skills that



have significance in the inclusive labor market through the context of the subject.

#### **4.2. Lack of ICT Access in the Virtual Classroom**

Despite the lack of access to ICT in the virtual classroom, and this originates in several social changes and the inequality of students with disabilities regarding the competence or implementation of ICT in the teaching-learning processes at school.

It is the most common that affects the insertion of the complementary subject regarding the new technology applied to art education in the curriculum of teaching studies in ICT on the use of educational software specialized in graphic design or digital graphic art. However, the majority of ICT teachers do not have the knowledge to provide a sociocultural space, favoring it with the support of the practice of social and labor insertion, especially for vulnerable youth and those excluded by accessibility in educational institutions at the school level.

#### **5. Conclusions and Recommendations**

One of the problems facing teachers for the incorporation of ICT into educational practice is in many cases the lack of both technological and instrumental, as methodological and strategic training.<sup>[7]</sup> There is a pedagogical model for the development of ICT standards, but it does not favor innovation and significant change for art education in special schools.

These paths of the complementary subject towards the opening of new autonomous learning scenarios, and different technological-artistic educational contexts. Just as the use of the didactic method through ICT for the classroom. Therefore, the special school to adequately meet their needs in an environment of respect, ethics, and tolerance.

Finally, there is very little space in our educational-labor system for adolescent students with disabilities to give them the opportunity to: learn their personalized autonomy in ICT in professional art or the future of study, both professionally and self-taught, assuming it with the development of skills and abilities for the students.

The lack of opportunities in training and specialization

of teachers to transform autonomous technological learning through visual communication on the transmission of ideas towards the important role of understanding the different message.

#### **Conflict of Interest**

There is no conflict of interest.

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ARTICLE

# English as Foreign Language (EFL) Teachers' Efficacy and Positive Achievement Emotions: Relations to Instructional Changes After Attending a Study Abroad Program

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ABSTRACT

Due to government policy, the number of study abroad professional development program for EFL teachers increased greatly in China during recent years. Study abroad program aims to help EFL teachers improve their knowledge and teaching practices, which requires them to make adjustments to their traditional teaching styles accordingly. Hence, teachers may experience strong emotional reactions when they are faced with different modes of teaching methods. From the perspective of "emotion", this study used control-value theory of achievement emotions as the theoretical framework to examine the relationship between teacher efficacy, positive achievement emotions, and instructional changes among 386 Chinese EFL teachers who attended study abroad programs. Purposive sampling was used in data collection. Data analysis was conducted using Structural Equation Model (SEM). The results showed that teacher efficacy correlated positively with positive achievement emotions (enjoyment, hope, and pride) and instructional changes. Positive achievement emotions mediated the relationship between teacher efficacy and instructional changes. Findings showed the impact of teacher efficacy and positive achievement emotions on changes in teachers' thinking and instructional practices. Based on the findings and limitations of this study, implications on teacher education and professional development program, directions and suggestions for future studies are discussed.

## 1. Introduction

Study abroad programs for teacher professional development attempt to help teachers improve their knowledge, skills, and perspectives, as well as incorporating a cross-cultural awareness into their teaching<sup>[1]</sup>. Therefore, study abroad programs often emphasize on changing teachers' teaching practices and developing more open-

mindedness to alternative teaching approaches by exposing teachers to new ideas and skills<sup>[2]</sup>. However, making substantial changes to teachers' teaching practices may trigger their emotional reactions because their pre-existing teaching beliefs are challenged<sup>[3]</sup>. When teachers study in other countries, their emotions may be challenged more intensively because they need to adapt to the linguistic, social, and cultural context<sup>[4]</sup>.

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Achievement emotions are important in teacher development in that emotions have been proved to influence cognition, decision-making, problem-solving and teaching approaches<sup>[5]</sup>. Since positive emotions are generally considered to promote learning<sup>[6]</sup>, it is necessary to examine emotions in teacher education and their antecedents for obtaining satisfactory training outcomes. Yet, research on positive emotions in EFL teachers' education and the relationships with their efficacy and instructional changes has only received limited attention in literature.

The present study aimed to address the deficits in literature. Based on Pekrun's<sup>[7] [8]</sup> control-value theory (CVT) of achievement emotions, this study examined the effects of teacher efficacy on three types of positive achievement emotions, including enjoyment, hope, and pride. Besides, the mediating role of positive emotions in relations between teacher efficacy and instructional changes were also examined. As noted, it suggests that teachers with high levels of efficacy will experience more positive emotions, which in turn, will be more willing to improve their teaching practices.

### 1.1 Teacher Efficacy and Instructional Changes

Self-efficacy is generally considered as a powerful motive of behavior. When individuals hold the beliefs that what they act will lead to the results they want, they will have the motivation to take actions and persist when encountering difficulties or challenging tasks<sup>[9]</sup>. Since changing instruction is a challenging task for teacher, the present study explains the impact of teacher efficacy on their instructional changes based on Bandura's<sup>[10]</sup> self-efficacy theory.

In the educational setting, teacher efficacy refers to a belief of one's capability in affecting students' learning and achieving expected educational outcomes<sup>[11]</sup>. Teachers with high level of efficacy tend to believe in their ability of affecting students' learning, manage class discipline better, be more supportive of students' autonomous learning<sup>[12]</sup>, implement more alternative teaching methods, and use more innovative teaching resources<sup>[13]</sup>. While encountering different or challenging tasks such as the implementation of new and innovative instruction, efficacious teachers tend to persist rather than avoiding.

Bandura's theory of teacher efficacy is consistently supported by empirical studies indicating that teacher efficacy strongly predicts their behavior, especially their instructional choices and practices<sup>[14] [15] [16]</sup>. For instance, research showed that teacher efficacy was correlated with their perceptions toward the implementation of new in-

structional practices<sup>[17]</sup>. The findings reported by Ghaith and Yaghi<sup>[18]</sup> also supported that teacher efficacy is a strong predictor of teachers' attitudes toward instructional changes. In addition, researchers found that teachers with higher levels of efficacy tend to adopt innovative instruction such as constructivist instruction instead of didactic instruction more frequently<sup>[19]</sup>. Therefore, one purpose of the present study is to testify the connection between teacher efficacy and instructional changes.

### 1.2 Control-Value Theory (CVT) of Achievement Emotions

Achievement emotions refer to emotions relevant to achievement activities or outcomes<sup>[7]</sup>. Eight emotions were identified as most commonly experienced in academic settings<sup>[20]</sup>. Based on the dimensions of valence and activation, three positive activating emotions (i.e., enjoyment, hope, and pride) were examined in the present study.

Achievement emotions are of great importance in learning and performance. Positive emotions not only urge learners to explore, but also serve to keep an open mind to target language<sup>[21]</sup>. Empirical studies identify that positive activating emotions such as enjoyment, hope, and pride help learners extend interest, focus on certain tasks, and adopt more flexible or deep learning strategies<sup>[6] [22]</sup>.

The present study incorporates CVT into the theoretical framework. CVT assumes that control and value appraisals are proximal determinants of certain emotions and afterwards outcomes. Control appraisals are defined as perceived causal impact of an agent on achievement<sup>[23]</sup>, usually operationalized as self-efficacy<sup>[24]</sup>. If learners can take more control of their learning, it is more likely for them to trigger positive emotions. Together with the impact of positive emotions on learners' learning and performance described earlier, it could be concluded that control appraisals should influence learners' achievement through their emotions. Hence, CVT assumes that positive emotions can play a mediating role between control appraisals and achievement. So far, CVT has been commonly studied from the perspective of students<sup>[25] [26]</sup> rather than applied to teacher emotions in learning.

However, Pekrun<sup>[7]</sup> posited that CVT assumptions can be applied to emotions experienced by teachers as well as students. In fact, emotions are crucial in teacher development<sup>[27]</sup>. Rogers<sup>[28]</sup> claimed that teachers' own learning experiences enable them to enter into their student' learning experiences by mutual emotional language, and thus understanding students deeply and eventually becoming better teachers. Previous research on teacher emotions primarily focused on anxiety without considering a wide

range of other emotions<sup>[29] [30] [31]</sup>. Empirical studies concerning the influence of positive emotions on teacher professional development have emerged not long ago<sup>[32] [33]</sup>. For example, Gu et al.<sup>[33]</sup> explored the impact of emotions such as love, satisfaction, and happiness on EFL teachers' professional development. Results indicated that these emotions can motivate teachers to make improvement in their instruction. Chen<sup>[32]</sup> examined the relationships among teacher efficacy, emotions, and their performance. Results showed that love and joy positively predicted their performance as related to teacher efficacy. These studies extend the empirical focus to the role of positive teacher emotions in their achievement.

Only a handful of studies have examined the relations among teacher efficacy, positive emotions and outcomes in teacher education. Based on CVT, a Chinese study was conducted to examine the affecting factor of teacher emotions in online training courses<sup>[34]</sup>. Findings found that teachers' sense of efficacy is a positive predictor to enjoyment and pride. Also, positive emotions are positively related to teachers' satisfaction and performance scores. When teachers experienced more enjoyment and pride in learning, they tended to perform better and improve the effectiveness of training. Besides of the positive correlation, recent research indicated that teachers' positive emotions (excited, inspired, and confident) can trigger their changes in teaching practices and thinking<sup>[2]</sup>. Up to present, it seems that no studies have explored the connections between teacher efficacy, positive emotions, and instructional changes in teacher development.

### 1.3 Research Aims and Hypotheses

In summary, based on the CVT assumption and self-efficacy theory, the present study explored the relations among teacher efficacy, positive achievement emotions (enjoyment, hope, and pride), and instructional changes within the context of the overseas teacher education program. The research question in the current study is proposed as following:

What are the relationships among teacher efficacy, positive achievement emotions, and their instructional changes?

The two hypotheses are listed as following:

Hypothesis 1. Teacher efficacy is positively related to positive achievement emotions and instructional changes.

Hypothesis 2. Positive emotions mediate the relationship between teacher efficacy and instructional changes.

## 2. Research Method

### 2.1 Participants and Procedures

Participants were 386 university EFL teachers (256 female, 130 male) from 11 public universities in Southeastern China. Participants were drawn by purposive sampling, who attended a study abroad professional development program. All full-time EFL teachers were invited to participate in an online survey through the URL link sent to them. The age of most participants ranged from 30 to 39 and the majority had 7 to 14 years of teaching experience. 87.0% held a Master degree and 76.2% were lecturer. At the beginning of the survey, teachers were informed of the purpose and a brief description of this research. The participants were guaranteed that their responses would be kept confidential. Three days before the deadline, the researcher sent an email to remind the participants of completing the online survey. The total number of responses was 397 with a participation rate 91%.

### 2.2 Research Instruments

#### 2.2.1 Teacher Efficacy

Teacher efficacy scale was adapted from Teacher Self-Efficacy Scale (TSES) developed by Bandura<sup>[10]</sup>. It consisted of 14 items on efficacy to influence decision making (four items; e.g., "How much can you influence the decisions that are made in school), instructional self-efficacy (six items; e.g., "How much can you do to get through to the most difficult students), and disciplinary self-efficacy (four items; e.g., "How much can you do to get students to follow classroom rules). Participants responded by using a five-point Likert scale (1 = nothing to 5 = a great deal;  $\alpha = 0.93$ ).

#### 2.2.2 Positive Achievement Emotions

The scale of positive achievement emotions was adapted from Pekrun et al.'s<sup>[24]</sup> achievement emotions questionnaire (AEQ) to assess three positive emotions, including one activity emotion (enjoyment) and two outcome emotions (hope, pride), which are proved as relevant to learning. It comprised 18 items on achievement emotions for enjoyment (seven items; e.g., "I look forward to studying"), hope (six items; e.g., "I feel confident when studying"), and pride (five items; e.g., "I am proud of my capacity"). Participants responded by using a five-point Likert scale (1 = not at all to 5 = very much;  $\alpha = 0.92$ ).



### 2.2.3 Instructional Changes

Instructional changes survey was adapted from Pop et al.'s [35] to assess teachers' changes to teaching practices after attending an overseas training program. The 12-item scale measured teachers' changes to teaching style (four items; e.g., "I adopted a more student-centered approach in teaching"), changes to class instruction (four items; e.g., "I made use of more collaborative activities in teaching"), and changes to thinking (four items; e.g., "I am more excited about attending other programs to enhance English expertise"). Participants responded by using a five-point Likert scale (1 = strongly disagree 5 = strongly agree;  $\alpha = 0.90$ ).

### 2.3 Data Analysis

The Structural Equation Modeling (SEM) was used in the present study to analyze the relationships among teacher efficacy, positive achievement emotions, and instructional changes. SEM makes it possible to test a number of hypotheses about the relationship among manifest variables, latent variables, and other variables [36]. Meanwhile, it is widely used because it can simultaneously test the direct and indirect correlations between variables in a single model [37].

Data analysis was conducted in three stages. First, confirmatory factor analysis (CFA) was conducted to test the factor structure of each construct. Second, direct effects between variables were assessed by SPSS-AMOS (Analysis of Moment Structure) 23.0. Third, SEM was used to estimate mediation. In the model, teacher efficacy served as predictor, positive achievement emotions as mediator, and instructional changes as the outcome. The mediational model tested the direct and indirect effects of teacher efficacy on positive emotions and instructional changes, combined with the direct impacts of positive emotions on instructional changes.

## 3. Results

### 3.1 Preliminary Analysis

Table 1 presents the CFA results of factor loadings and model fit indices. The fitness indices of all constructs should satisfy the criteria: (1) Root Mean Square Error of Approximation (RMSEA) < .08; (2) Tucker-Lewis Index (TLI) and Comparative Fit Index (CFI) > .90; (3) Chi-Square/df < 3.0 (Awang et al., 2018).

Based on the criteria above, the 14-item teacher efficacy model presented an acceptable to good model fit (RMSEA = .034; CFI = .989; TLI = .987; Chi-Square/df = 1.455). The 18-item achievement emotions model

presented an acceptable to good model fit (RMSEA = .041; CFI = .975; TLI = .972; Chi-Square/df = 1.648). The 12-item instructional changes model presented an acceptable to good model fit (RMSEA = .047; CFI = .981; TLI = .976; Chi-Square/df = 1.868).

**Table 1 Confirmatory Factor Analyses (CFA) Results of Constructs**

	Factor loadings	RMSEA	CFI	TLI	Chi-Square/df
Teacher Efficacy	.70-.90	.034	.989	.987	1.455
Positive Emotions	.65-.81	.041	.975	.972	1.648
Instructional Changes	.71-.87	.047	.981	.976	1.868

Note. Factor loadings are standardized coefficients. All factor loadings are significant at  $p < .001$ .

The mean, standard deviations, and Pearson product-moment correlations of variables are shown in Table 2. Descriptive statistics from the construct of achievement emotions indicated that Enjoyment was rated as the most frequent emotion ( $M = 3.71$ ,  $SD = 0.78$ ), while Pride was ranked as the second most frequent emotion ( $M = 3.67$ ,  $SD = 0.79$ ), followed by the other emotion Hope ( $M = 3.52$ ,  $SD = 0.84$ ). Teacher efficacy, the predictor in the model, correlated significantly and positively with enjoyment ( $r = .288$ ,  $p < .001$ ), hope ( $r = .299$ ,  $p < .001$ ), and pride ( $r = .270$ ,  $p < .001$ ). The predictor is also related to instructional changes ( $r = .489$ ,  $p < .001$ ). Besides, instructional changes correlated significantly and positively with enjoyment ( $r = .451$ ,  $p < .001$ ), hope ( $r = .553$ ,  $p < .001$ ), and pride ( $r = .439$ ,  $p < .001$ ).

**Table 2 Mean, Standard Deviation, and Pearson product-moment Correlations**

	M	SD	1	2	3	4
1. Teacher Efficacy	3.63	.83				
2. Enjoyment	3.71	.78	.288			
3. Hope	3.52	.84	.299	.596		
4. Pride	3.67	.79	.270	.553	.508	
5. Instructional Changes	3.46	.70	.489	.451	.553	.439

Note.  $N = 386$ .  
 $p < .001$ .

### 3.2 Hypotheses and Model Testing

As noted in Table 2, the correlations were in line with all hypotheses. Structural equation modeling was used to further test the hypotheses. In accordance with the hypotheses, all possible paths from teacher efficacy to

each positive emotion and instructional changes were tested through standardized estimates. The model-data fit for the hypothesized model was acceptable to good fit (Chisq/df = 1.692,  $p < .001$ , RMSEA = .042, CFI = .987, TLI = .980). Standardized coefficients are presented in Figure 1. The results supported Hypothesis 1 that teacher efficacy was positively related to positive emotions ( $\beta = .43$ ,  $p < .001$ ) and instructional changes ( $\beta = .37$ ,  $p < .001$ ). Besides, positive emotions were positively related to instructional changes ( $\beta = .60$ ,  $p < .001$ ). In sum, the results suggested that teacher efficacy had indirect effects on instructional changes through positive emotions. The fit of the overall model is consistent with Hypothesis 2.

### 3.3 Mediation and Bootstrapping

Furthermore, bootstrapping method was used to confirm the existence of mediation proposed in Hypothesis 2. Table 3 shows the bootstrapping results for estimating indirect effects with 95% confidence intervals. Positive emotions significantly mediate the relationships between teacher efficacy and instructional changes, because their

bias-corrected bootstrap confidence interval did not include zero and the Z values of the total effect, indirect effect, and direct effect are greater than 1.96, supporting mediation effects.

Taking these together, teacher efficacy positively predicts positive achievement emotions and instructional changes, and positive emotions (i.e., enjoyment, hope, and pride) mediate the relationship between teacher efficacy and instructional changes. Therefore, all the four hypotheses proposed in the present study have been confirmed in this structural model.

### 4. Discussion

The current study investigated relations among teacher efficacy, positive achievement emotions, and instructional changes. In other words, the study assessed the effects of teacher efficacy on positive achievement emotions and instructional changes. Furthermore, the study examined the effects of positive achievement emotions mediating the relations between teacher efficacy and instructional changes.

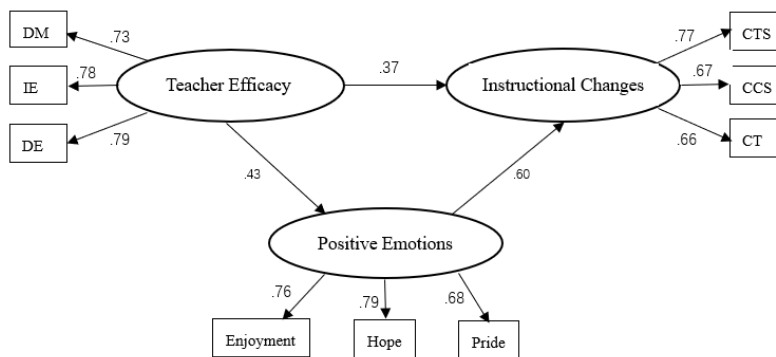


Figure 1. Structural equation model with standardized coefficients

Note. All paths in structural model analysis are significant at  $p < .001$ .

Table 3 Bootstrapping Results for Estimating Indirect Effects with 95% Confidence Intervals (CI)

Variable	Point Estimate	Product of Coefficients SE	Z	Bootstrapping (2000)		Two-Tailed Significance
				Bias-Corrected Lower	95%CI Upper	
Standardized Total Effects						
TSE→IC	0.625	0.056	11.161	0.510	0.727	0.000
Standardized Indirect Effects						
TSE→PEM→IC	0.259	0.054	4.796	0.166	0.382	0.000
Standardized Direct Effects						
TSE→IC	0.367	0.073	5.027	0.215	0.511	0.000

Note.  $N = 386$ .  $SE$  = bootstrap standard error. Point estimate, SE, and 95% CI were obtained from 2,000 bootstrap samples. TSE = teacher efficacy. IC = instructional changes. PEM = positive emotions.

In line with Hypothesis 1, teacher efficacy positively predicted the positive emotions (i.e., enjoyment, hope, and pride). This result is in line with previous research that teachers with higher levels of efficacy are more likely to experience positive achievement emotions<sup>[32]</sup>. Specifically, teachers' confidence in instruction results in their enjoyment during the learning process, and in turn leads to more energy and vigor, higher sense of enthusiasm and pride, and higher level of concentration and happiness<sup>[38]</sup>. On the contrary, as the less efficacious teachers do not have much confidence in teaching, when they find their shortcomings in the interaction process, they may experience less enjoyment in the training<sup>[39]</sup>.

Besides, teacher efficacy was a positive predictor of instructional changes. In other words, when the level of teachers' sense of efficacy increases, they are more willing to change their teaching practices and thinking. The results were consistent with several previous studies<sup>[40]</sup><sup>[41]</sup>. Teachers with high level of efficacy exert more efforts on innovating new instructional strategies to make a difference in their students' learning<sup>[40]</sup>. Besides, teachers with less control over students' disruptive behaviors tend to use less innovative teaching methods to avoid dealing with a noisy class<sup>[42]</sup><sup>[43]</sup>. Within the Chinese context, when teachers have low efficacy in affecting school decision making such as a lack of autonomy in adopting teaching resources, the large-size classes, and the examination system, they are less likely to make changes and innovation<sup>[44]</sup>.

Consistent with Hypothesis 2, the findings suggest that the effect of teacher efficacy on instructional changes was mediated by enjoyment, hope, and pride. The control-value theory of achievement emotions is fully supported by the results of the present study. This finding is in line with the findings from the literature that teachers who believe they have the ability to organize their class and foster students' achievement will experience more positive emotions and implement more effective teaching strategies in class<sup>[43]</sup>. Specifically, positive achievement emotions predicted instructional changes. The findings of the present study implied that although positive emotions act as mediating variables, they are also important variables affecting teachers' instructional changes. The results supported the existing research that teacher emotions are either hindering factors or driving forces of their self-transformation<sup>[45]</sup><sup>[46]</sup>. When teachers experience positive emotions, they tend to regard their activities as meaningful, self-fulfilling, and inspirational, and become more concentrated and devoted. The positive emotions such as enjoyment, enthusiasm, and satisfaction enable teachers to be more open-minded in accepting new goal-setting, and to achieve the related

goals more actively<sup>[47]</sup><sup>[48]</sup>. Enjoyment and happiness encourage teachers to seek for unconventional teaching strategies, while excitement and enthusiasm inspire them to integrate new teaching methods into daily teaching practices. The feeling of pride and satisfaction increases teachers' desire to learn new knowledge and skills and enables them to believe that their efforts are worthwhile, as well as strengthening their positive attitudes toward teaching.

## 5. Implications

The present findings may add values to relevant theories, as well as educators involved to contemplate and act upon. First, this study extends the theory of teacher efficacy and the theoretical model for the outcome of teachers' overseas training. Also, it confirms that CVT can be applied to teacher studies. Besides, it also contributes to the current findings on the role of positive emotions in further education for teachers.

Second, the results of the present study are helpful for teacher education. Although study abroad program aims to improve teachers' traditional teaching practices, it may not result in successful instructional changes. This study informs that teacher efficacy is a key antecedent of positive emotions and instructional changes in the eyes of in-service EFL teachers. In the past, training program is viewed as an abstract, mechanistic, and dispassionate process that teachers make progress through a series of steps. The present study indicates that teachers' growth and changes are highly personized, which needs to be driven by their sense of efficacy and emotions toward the people and process around them. The training programs for teacher education might provide relevant guidance in emotional strategies and regulation as well as fostering teachers' sense of efficacy. For example, school could organize collaborative activities with useful resources provided by the returnees from the training program, which acts as a kind of vicarious experience and social persuasion<sup>[10]</sup>, to promote teachers' instructional changes directly through increasing teachers' control of teaching, and then cultivate positive emotions as well.

## 6. Limitations and Future Research

A few limitations need to be taken into account and may provide directions for future research. First, it is hard to confirm any firm causality among variables in the present study. learners' emotions can influence their performance and academic achievement, while in turn will reciprocally impact their control appraisals that shape their emotional experiences in future<sup>[22]</sup>. The shortcoming

of the existing literature is the lack of consensus regarding the direction of causal relations and which pathway is more significant. The theoretical and empirical research on the bidirectional and multi-directional relations among teacher efficacy, achievement emotions, and instructional changes need to be further studied.

Second, the present study examined three positive activating emotions including enjoyment, hope, and pride. However, the influence of negative emotions when mixed with positive emotions are considered to be important to teacher learning as well. In the future, from the dimensions of valence and activation, negative activating emotions such as anxiety and shame and negative deactivating such as boredom and hopelessness should be taken into consideration as well. Since one single emotion may trigger a constellation of emotions, future research can focus on exploring a network of teacher emotions.

Third, the findings in the present study are based on teachers' self-reporting that may result in inaccurate perceptions toward their efficacy, emotions, and instructional changes. Future studies would be desirable if a richer range of assessment from multiple stakeholders such as peers, superiors, or students could be involved.

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