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Experience-First Methodology: Teaching English Vocabulary through STEM Curriculum

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Abstract

The Experience-First methodology is based upon more than 30 years' experience teaching STEM courses in astronomy, physics, chemistry, and Earth science at the secondary and undergraduate level in Southern California. In the communities where the researcher taught, more than 50% of the student body were ESL students, most of whom did not speak English in the home. Using low-cost science pedagogy, students constructed their own models and equipment and then used those materials to conduct scientific experiments and observations. Each student's experience in constructing and using scientific equipment and models was then used as a basis for the acquisition of vocabulary to enable the student to discuss and share their work. This methodology was significantly more effective than giving students a list of vocabulary words and definitions to memorize before the laboratory activity was attempted. This methodology was validated by consistently high scores on standardized, end-of-year tests and by student success in undergraduate and technical careers after graduation.

Introduction

Teaching in schools with high-risk populations forces the educator to come to grips with the twin problems affecting both the school and its students, high poverty rates and large, diverse ESL populations. For the school and its teachers, lack of funding means that there is little money available for classes in STEM areas to purchase equipment for laboratory exercises. What little money there is usually goes to consumable items for biology and chemistry classes. Classes such as astronomy and physics get little support and often suffer from a lack of modern equipment.

In Riverside County, California where the researcher spent the majority of his career, more than 50% of the population were ESL students. Although the dominant ethnicity was Hispanic, there were more than 60 languages and dialects spoken at area schools across Riverside County. Although California tried bilingual education in Spanish for many years, this experiment was unsuccessful and left native speakers of other languages without services. Some ESL students were placed in Spanish language bilingual classes and forced to learn science or mathematics in a third language different from English and their native tongue.

Bilingual education efforts broke down on two fronts: first, the program did not succeed in producing successful graduates fluent in English, second the program actually discriminated against all speakers of languages other than Spanish. The state program also struggled for years to find enough Spanish-language educators for specific subjects, especially in the STEM classroom. California finally settled on providing a 12-hour training course for every educator in the state, and awarding every teacher with an ESL teaching certificate. The state then abandoned the bilingual education program altogether in 1999, effectively telling teachers: 'It's your problem now.'

Although bilingual education as it was implemented in California was discriminatory and did not work well on a practical level, it also had an unintended consequence; during the 18 year period when English-only instruction was in place in California, most certified bilingual teachers left the state. (Sanchez, 2016.) Even now, California's Proposition 58 leaves it up to local districts to decide whether or not to provide bilingual education, but the problem of how to provide effective English language acquisition is still in the teacher's lap because of the great variety of languages spoken in classrooms. A more universal methodology was needed for the average classroom teacher, as the standards-based movement, Common Core, NCLB, etc. all place the responsibility for classroom-wide success upon the educator's shoulders.

Methodology

The methodologies for low-cost science and experience-first pedagogy emerged organically in the classroom rather than from a pre-planned investigation. Simply put, as a teacher in the classroom with almost no equipment funding and a high percentage of ESL students, the researcher had to find a way to address the daily challenges in his classroom so that all students could be successful.

The equipment problem was the first thing that needed to be addressed. Looking at catalogs for lab equipment that would be appropriate for the STEM classes being taught, the researcher realized that much of the necessary equipment for physics laboratory investigations was relatively simple in nature and could be constructed by the students themselves with proper tools and guidance from the instructor. Constructing equipment using relatively low-cost materials from the local home improvement store, requesting tool donations from parents, even scouring garage sales and flea markets for old tools; these methods allowed the researcher to gather the necessary tools for students to build their own equipment in class.

It soon became apparent that having students build their own equipment added a new dimension to the science laboratory experience. Students gained a new appreciation for the experimental equipment itself, both in how it functioned, and of the effort needed to acquire the equipment. With student-built equipment in the classroom, the frequency of incidents of vandalism and equipment damage dropped almost to zero. Students became not only knowledgeable, but proudly possessive of their equipment.

The researcher also noticed that when ESL exhibited a strong tendency to self-select into homogenous language groups. Students who grouped together to work on building a piece of equipment all worked together in their native language. Even when working silently, students reported later that they thought about the project in their own language. These students were working together in their own language without being taught in their native language. More importantly, these students were gaining practical experience in many areas: tool use, safety procedures, equipment design, equipment maintenance and calibration – all of these in their native languages. It was not uncommon in the researcher's classroom to have four or more languages being spoken at one time on laboratory workday.

The students were gaining another valuable commodity – they were acquiring actual working experience in the STEM classroom. We are not talking about mere vocational experience, but actual scientific experience as well. With each student having a common experience building experimental equipment in the classroom, it became apparent that each student's experiences now became a foundation for learning technical STEM vocabulary.

When the students had acquired actual experience in a STEM activity, giving the students the vocabulary needed to then discuss what they had built and learned about became far easier. When each student in the classroom had a shared experience, albeit in their own language, giving the students new English vocabulary became another effective tool for the student, rather than an additional assignment. English became a common language to discuss common experiences, and to critique each other's work, ask critical questions, and share results.

Vocabulary acquisition became faster and easier for all students in the STEM program. The result was that most vocabulary lists and assignments were dropped from the physics lab classes all together; these assignments had become redundant. Some vocabulary lessons were maintained, but these usually consisted of reviews after a laboratory project was over rather than the preliminary lesson in a unit of study. Exemplary test results well above the average for our school became common place rather than rare among the students in the school's STEM program.

Extending the Methodology to Other Classes

It was soon possible to extend the experience-first pedagogy easily into chemistry classes, but astronomy remained a challenge. Astronomy was an equipment intensive discipline and essentially an observational science; could the experience-first model be made to work here?

One of the challenges of teaching an observational astronomy course lay in the nature of the course material and concepts rather than the acquisition of equipment. The researcher was able to write small grants for the purchase of equipment, and because astronomy equipment is almost entirely durable and low-maintenance in nature, ongoing funding was not necessary to the success of the laboratory program. Soon, the astronomy program had all the equipment that was needed for observational lab nights.

The challenge in teaching this course lay precisely in the observational nature of the laboratory exercises. Young millennial students are bombarded by images. The ready availability and pervasive nature of smart phones, tablets, computers, internet access, and streaming video meant that students spent many hours each day digesting images on a screen.

According to the Connected Kids report compiled by the Childwise market research group, teens today spend 7.5 – 8 hours per day watching images on a screen, up from 2.5-3 hours per day in 1995. (Connected Kids: Trend Watch, 2017.) For classes with primarily observational laboratory activities such as biology and astronomy, this overload of screen images is quite problematic. When students go to an astronomy activity and look through binoculars or a telescope at the Moon, it becomes merely one more image among many hundreds already viewed that day.

The relentless montage of images makes critical observation very difficult for the school age child. According to a 2006 CBS News report, the number of images a person is exposed to rose from approximately 500 per day in the 1970's to over 5,000 per day by 2006. (Johnson, CBS News, 2006). The Business Journal claims that active internet surfers see over 11,000 advertisements per day – surely the total sum of images we see are far higher. (Sanders, 2017.) The question of how to cut through the visual clutter in a child's life is a pressing one for the modern educator.

For the astronomy laboratory curriculum, low-cost science methods and experience-first pedagogy again proved effective in the classroom. Before implementing experience-first pedagogy in the classroom, the researcher often found that evening laboratory events were less than successful. Students (and adults!) often looked through the telescope, shrugged and said:

'It's the Moon.', and then walked away unimpressed. It was often difficult to get students to observe carefully and make note of what they saw in the eyepiece. An added difficulty was that the telescope is strictly a solo instrument; only one person at a time can look through the eyepiece and the instructor cannot in any way point out features to the student as they observe.

Constructing an Experience-First Model

The solution was to implement an experience-first exercise, helping students to each build a model of the lunar surface in clay. Using a light-colored, non-drying clay, the students made a 15x15x1 cm square. A large marble was used to make a 6-8 cm depression in the clay square, then a small amount of dark clay was used to overlay the depression. This modeled a *maria*, a large crater (150 km wide or greater) on the lunar surface that had later filled with dark, iron-rich lava from the Moon's interior.

Next, smaller marbles and round beads of various sizes are used to model smaller craters from 0.1 – 2 cm wide. The number of craters created increases as size decreases. The marbles were rolled a bit as they were pressed into the clay to create *crater rims*. Small bits of clay were placed in the center of some of the larger craters to represent *central mounts*, mountainous features peculiar to large lunar craters. With an abundance of craters, students readily noticed that some craters overlapped earlier features; this allowed us to introduce the idea of *geological chronology* – exploring the age of features by studying their overlapping nature on the lunar surface.

After this, students used a golf tee or a blunt pencil to make marks surrounding craters representing the *ejecta blanket* formed by rocky material blasted out of newer craters less than 50 million years old. *Rays*, exceptionally long streaks of dusty material, were drawn on our model using golf tees, and finally the golf tees were used to put a plethora of *minor craters* all over the face of the models. The last step was to use the edge of a steel ruler to mark out lines of longitude and latitude, making a 2-cm grid on our model.

As we worked on the models, students were introduced to these and other vocabulary terms in the classroom. Having the experience of creating the lunar features on a clay model before being given the vocabulary terms was a powerful experience. After creating the models, students paired off and shared what they had learned and created by showing and describing the models in English to their partners. Since the vocabulary and concepts were new to everyone, no particular advantage was had by the native English speaker over the ESL student; everyone worked equally hard to become fluent with the new vocabulary.

Further work was done with the models once they were created. Students drew a 2-cm grid on a piece of construction paper and made an accurate map of their models. On the Moon, craters and features on the near side are primarily named for Western and European scientists and mathematicians. In the classroom, students were now allowed to develop their own naming schemes using bands, films, food, or their own cultural references. The features were then named and a key to the maps were made for each model.

Students went on to make rulers and scales. Each 2-cm square represented 100 km, the paper rulers were divided in increments of 25 km. Latitude and longitude or 'GPS' coordinates were determined for each major feature and a list of coordinates was added to the list of names on each map key. Pythagorean theory and the distance formula were used to determine distances between major landmarks. Students then used eye droppers and filled each crater with water to determine its volume; crater volume was used as an analog measurement for impact energy.

After several days of study making, mapping, measuring, and studying the lunar surface models, students were then allowed to participate in an evening astronomy lab looking at the lunar surface for the first time at a variety of magnifications. (Barth, 2018.)

Unlike previous years' lab experiences, the students brought a wealth of knowledge to the eyepiece when they looked at the Moon for the first time. The view through the telescope was no longer just an image, one among thousands, it was a unique experience confirming the hypotheses that the students had made in clay in the classroom the week before. The experience-first methodology not only improved the English language vocabulary of the ESL students without regard to their native language, it improved the quality of the laboratory observation experience for every student and make the laboratory observation more meaningful to everyone in the class.

Results

The experience-first and low-cost science methodologies for STEM educators have been used to develop the *Astronomy for Educators* program at the University of Arkansas where educators learn to utilize these pedagogies to teach STEM curriculum in an effective way without regard to barriers of cost or English language fluency.

These materials and lessons were taught to a group of 32 international educators gathered at the University of Arkansas this spring with great success. The educators responding to a post-event survey showed a broad acceptance of these methodologies and most indicated an interest in using the methodologies in order to improve their teaching of English language vocabulary through experience-first curriculum in their own countries. There were 6 questions answered on a Likert-type scale from 1 – 5 representing Strongly Disagree to Strongly Agree (see Appendix A for the complete results by question). Question #1 asked if the teachers enjoyed the presentation, the score was 5.0 indicating exceptional engagement with the curriculum.

Question #2 asked if the teachers learned new ways of teaching using low-cost science methods, the score was 4.58. Some of the educators indicated that they taught in conditions of poverty in their own countries and that low-cost methods were not novel for them.

Question #3 asked if the teachers had learned new ways to teach English vocabulary with the experience-first method, the score was 4.58. This was an exciting result since the experience-first methodology was at the core of teaching ESL students without regard to native language using STEM curriculum.

Question #4 asked if the teachers planned to use the experience-first method when they returned home. The average score was 4.68, indicating a strong acceptance of the method and a good fit with the school system in the teachers' home countries.

Question #5 asked the teachers if they planned to use the *Astronomy for Educators* text, the score was 3.69; several teachers commented after the presentation that they did not teach any STEM curriculum and therefore had no plans to use the book.

Question #6 asked the teachers to rate the overall presentation, the score was a 5.0 which was gratifying and indicated that the presentation was well planned and executed.

These materials are now published by the University of Arkansas as an Open Educational Resource available at no cost to any educator. It is hoped that these methodologies become more widespread, not only in teaching astronomy and space science, or STEM curriculum, as initial results show that the principles can be applied successfully to any curriculum.

Discussion and Implications

The use of low-cost science methodologies and the effective English vocabulary acquisition for ESL students in the STEM classroom represents a personal journey of discovery for this researcher. A childhood spent in a homogenous school culture with virtually no ESL population left the researcher poorly prepared for the widely diverse cultural and linguistic environment found in urban, Southern California school systems. The researcher found that neither his life experiences, nor his training in science or academic studies in education prepared him for these ongoing challenges in the secondary classroom. As a professor of STEM education, the researcher has found that today's pre-service teachers are at much the same disadvantage. For many education students, neither their life experience nor their academic training has effectively prepared them to be successful in a linguistically diverse classroom.

The experience-first methodology not only addresses the gap in the teacher's academic training, it specifically does not depend upon the multi-lingual skills of the teacher in the classroom – in fact, this methodology assumes that the educator has no such skills.

The author saw bilingual science education firsthand for 18 years. The classroom next door taught biology in Spanish. The author noted both by observation and in curriculum development discussions with bilingual STEM education teachers, that much of the technical STEM concepts and virtually all of the more challenging (and rewarding!) laboratory exercises were stripped from these classes in order to substitute vocabulary acquisition lessons. It was common to hear the teacher speaking in Spanish, and then to lead students in a call-and-response teaching them the parts of a cell or an ecosystem.

These bilingual education students did not however, spend time with microscopes looking at cells, make models of cellular components, or take field trips to observe actual ecosystem; they were too busy filling out vocabulary worksheets. And as for students who spoke German, Russian, French, Japanese, Vietnamese, Tagalog, and many other languages, they were blatantly discriminated against – there were no classes or language support services at all for them. The other, more universal discrimination was that bilingual classes began and ended with elementary biology; no classes in honors biology, AP classes, chemistry, physics, or astronomy classes were offered in a bilingual format.

We cannot possibly supply teachers for every language group for every STEM class at every level. The logistical problems are insoluble, and the financial burdens unsustainable. Further, the smaller and more rural a school district is, the more intractable the logistical and financial problems become. There is a further problem that bilingual students are unfairly segregated from their English-speaking peers. This segregation is wrong on its face, and further does nothing to develop a tolerant and accepting culture for the students.

The experience-first methodology eliminates these problems at their source. It eliminates the necessity of specific multi-lingual skills on the part of the classroom teacher. For the small or rural school districts which often have difficulty recruiting enough qualified STEM educators, this means that they can hire an experience-first qualified educator who can serve all the local students. It does not matter if there are a handful of ESL students or hundreds, all can be served successfully. If the district experiences an influx of new ESL students, there will be little or no impact in test scores or the level of educational service provided by the existing staff.

Adding low-cost science methodologies solves another fundamental problem in STEM education – equal accessibility. Small and rural schools often limit their STEM curriculum offerings not because they do not have the staff or student interest, but because of the financial

burden of supporting multiple STEM disciplines and purchasing and maintaining expensive laboratory equipment. For both the rural and urban school, the realities of financial pressures force administrators to make "this or that" choices. It often comes down to the reality that if we do not have funding for everything we want, we must make do with the basics. Equipment intensive classes such as physics and astronomy are often cut.

The educator who trains students to construct their own laboratory equipment is free of almost all of these financial pressures. Schools that adopt low-cost science methodologies are able to offer access to a diverse and high-quality STEM experience to all students. The use of experience-first methods means that these opportunities are equally available to students from any cultural and linguistic background. Removing linguistic, geographic, and financial barriers restricting access to quality STEM education programs is perhaps the most profound and far reaching benefit of these methodologies.

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Appendix A

Post Presentation Survey on the Experience First Methodology: *
1 – Strongly Disagree. 2 – Slightly Disagree. 3 – Neutral. 4 – Slightly Agree. 5 – Strongly Agree.

Answer	Question:
5	I enjoyed the presentation by Dr. Barth.
4.58	I learned new ways of teaching using ***Low-Cost Science*** methods.
4.58	I learned new ways to teach English vocabulary using ***Experience First*** methods.
4.68	I plan to use Dr. Barth's methods in my own country when I return.
3.69	I plan to use Dr. Barth's book: ***Astronomy for Educators.*** **
5	Please rate the overall quality of the presentation (1 = poor, 5 = excellent.)

Note: 19 students (60% of the attendees) responded to this survey within 7 days of the presentation.

** Note: On the question regarding the use of the ***Astronomy for Educators*** text, less than half of the educators were involved in STEM curriculum.

Are We There Yet? The Journey, Destination and Time Conundrum Regarding the Education of African Americans in Arkansas

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Abstract

Studies comparing educational achievement by students of African descent to that of students of European descent, typically assess personal variables to explain "gaps" or differences in performance. Sociopolitical and historical, i.e., systemic, realities receive limited consideration. This inquiry diverges from deficit models explaining performance differences as functions of personal variables. Teacher quality as a systemic variable is analyzed. Using an allegory based on a trip with young children, the "journey" of African Americans in the Arkansas education system is analyzed - sociopolitical and sociohistorical realities (terrain); teacher quality proxied by salaries and National Board Certification (supplies); and travel time. The implications of positionality (driver) for framing causality and interpretations of disparities in educational outcomes are explored. Further research of systemic variables' effects on educational practices and student achievement is recommended.

Introduction

The efficacy of education obtained by African Americans is a major concern nationally and locally (Ansell, 2011; Hill, 2011; Carter & Welner, 2013). Coined as the "achievement gap," students of African descent[1] perform at significantly lower levels compared to those of European descent. Investigations to account for this lack of achievement largely focus on personal variables such as family, peers, communities, etc. This highly complex topic is rarely examined for the implications of social, political, historical and cultural factors. For example, there is little (if any) consideration given to the effects of 300+ years of oppression, tyranny and discrimination. Moreover, the prevailing practice is to adhere to the meritocratic vision of the American educational system that obfuscates the systematic and systemic oppression that continues to exist. Although it is not as overt as previously, oppression remains very tangible in its manifestations and evident in its resultant effects. Reframing the achievement gap as an opportunity gap linked to sociohistorical and sociopolitical reality is a recent development (Carter & Welner, 2013). Ladson-Billings (2013) says it is an education debt that if not paid, requires at least acknowledgement as affecting the educational outcomes (achievement gap) we monitor so closely. The implications of time for the interpretation of this phenomenon has been given miniscule attention. Many refer to the Brown v. Board of Education (1954) decision as the defining turn of events leading to equal educational opportunity for all. However, some researchers, based on reasons beyond the reach of this paper (Bell, 2005) have deemed this assessment misguided.

[1] The terms, students of African descent and Black children are used in conjunction with African American to include children born in American as well as children of the African

Discussion and investigation of the "achievement gap" gives substantial attention to the relatively short 60+ years since the Brown v. Board of Education decision. The discourse is centered on reasons for the overall lack of achievement by children of color based on a white standard. The window of 60+ years is based on the erroneous premise that the legislation and cessation of discriminatory practices were virtually simultaneous. Once the changes were legislated, the search for the lack of instant mobility of students of African descent centered on personal characteristics, such as socioeconomic status, family structure, culture, etc. (Ansell, 2011) Seldom considered is how the academic experiences of students of African descent are adversely affected by remnants of 300+ years of systemic tyranny and oppression. Minimal attention is given to the continuing inequitable resource allocation among schools based on the characteristics of students who attend them. This one-sided, time-limited perspective is reminiscent of anxious children on a road trip experienced by the author so long ago.

Years ago, my mother and I made a twelve-hour, cross-country trip by car with four children, ages four to eight. The trip pre-dated iPhone and iPad, and I could not afford an entertainment package. The hand-held devices were pencils and crayons. We did our best to prepare the youngsters for the trip by reminding them that we would be in the car a long time and they could take anything to play or read. Twenty minutes into the trip, we slowed down to merge onto a two-lane highway from the interstate and the four-year-old asked loudly, "Are we there yet?" I looked at my mother and said, "This is going to be a long ride."

Many investigators approach the performance differential between students of African descent and those of European descent using a time perspective similar to that of this four-year-old. To them, Arkansas has been at this long enough to have arrived at our destination, closure of the achievement gap. Given the years of legislated inequity, could we have arrived this quickly? However, when it comes to the education of African Americans in Arkansas, perceptions of adults are reminiscent of the four-year-old in that a naive, distorted conceptualization of elapsed time vs, “equal/equivalent” time is displayed. Here, “equal/equivalent time” refers to time during which African Americans students are endowed with educational resources equivalent to those available to their white counterparts. Exponential changes in achievement are expected in 60 plus years based on the aftermath of legislated changes to a system of exclusion that was sustained for centuries. Few "knowledgeable" people demonstrate recognition of the implications of the "distance" (the years of inequity and exclusion), the "terrain" (the entrenched nature of segregation), or the "destination" (expectations of academic progress).

Trip preparation includes planning for things we can and cannot control. Things we control lend themselves to planning much more readily than those that are not. Because most elements of a student's home life and background are beyond the purview (control) of schools, it is misguided to focus on these factors and largely ignore systemic variables that can and should be adjusted. A school has little influence on a student’s home life and background. However, the continued focus remains on conditions least susceptible to "treatment" by an educational system rather than relevant environmental variables that can be substantially influenced by the system.

This paper examines factors considered to be malleable by those in power. Whereas background factors have remained prominent to explain the lower achievement for African American students nationally and locally (Greene, Barnett, Ritter, & Winters, 2006), they are misguided, simplistic and/or distorted. This paper explicates this topic from another stance by taking into account sociopolitical and historical factors rarely considered. By looking at teachers

and the inequitable quality/treatment that exists across districts within the state, the paper examines career indicators, specifically salaries and National Board Certification as indicators of inequity. "Are we there yet?" is a metaphorical framework for addressing the issues. "We" refers specifically to students/people of African descent within the state. "There" refers to the destination, educational achievement. "Yet" encompasses varied perspectives gauging time and progress. Positionality and how it affects the identification of an appropriate destination, the determination of when it is reached, and time are examined as it relates to these aspects of the trip. One's position or "place" will lead to different interpretations given the varied and inequitable inputs that prevail in today's educational system.

The Driver

A reader's, personal perceptions are often a catalyst and major influencer on the interpretations given to what is read. Positionality is a concept that acknowledges the effects and implications of one's experiences and demographics (gender, race, socioeconomic status, etc.) on research perspectives and interpretations (Arber, 2000; Briscoe, 2005; Milner, 2007). Positionality is integral to this paper's premise that interpretations of progress are a function of one's position and the ideological stance reflected in it (Briscoe, 2005; Milner, 2007).

Based on positionality, it is important to know the perspective of a study's author(s), i.e., the driver, as it relates to this paper. My demographic positionality originates from growing up in a lower-income, majority African American, urban community. This demographic positionality contributes to my ideological positionality and "insider" position on this issue (Arber, 2000; Briscoe, 2005; Milner, 2007). My experiences mediate and influence my understanding and interpretation of rationales regarding the lack of academic achievement, e.g., lack of interest, motivation and drive to learn, as the reason for educational progress. What is written leaves me with questions regarding the nature, context, and meaning of these varied perspectives on this topic (Perry, Steele, & Hilliard, 2003). This paper's context is influenced by this perspective/positionality.

"We" - African Americans Social and Historical Realities in Arkansas

For this paper, "we" refers to people of African descent in the state of Arkansas. The state's historical, social, and political realities for people of African descent reflect national trends but also have unique attributes (Anderson, 1988; Gehring, 2004). These differences have implications for educational processes and must be taken into account. For some, these demographic realities are a backdrop for their explanations for academic discrepancies; for this paper they are germane to the understanding of the existing systemic inequities.

According to the U.S. Census, American Community 5-year [2013 – 2017] Survey, Arkansas is the 33rd largest state with a population of 2.98 million. The residents are dispersed across 75 counties ranging from 5,194 in Calhoun County (southern Arkansas) to 392,848 in Pulaski County (site of the largest city and capital, Little Rock) (see Appendix). Fifty-six (75%) of the counties have populations less than 40,000. In 23 (41%) of the 56 counties, at least 20% of the residents are of African descent. People of African descent make up more than 20% of the population in six of the 19 (32%) counties with populations of more than 40,000 (see Appendix). Patterns of living are also of note. People of African descent are concentrated in the southern and eastern regions of the state with relatively few of them in the northern and western sections.

There are similar divisions in regard to income. Compared to the nation as a whole, Arkansas is lower in median income. The national median income is $57,652 and $43,813 for Arkansas. The five counties with the lowest median incomes ranging from $27,036 in Desha County to $31,584 in Monroe County, are in counties with larger percentages (27.5% to 56%) of African Americans (see Appendix). Of the five counties with the highest median incomes in the state, $49,968 to $61,271, African American population range from 1.6% to 11.4%.

Historically, larger numbers of African Americans resided in the Arkansas Delta – a once prosperous area of fertile farmland and varied manufacturing businesses. People of African descent were the majority among those working on the farms and in the industries; employment prospects were plentiful. In recent years, the region's prosperity has been replaced by economic hardships and is home to some of the lowest median incomes and the highest rates of poverty in the nation. People of African descent living in smaller, rural communities in the southern and eastern sections of the state are likely to have lower incomes and higher rates of poverty. This reality diverges from national trends and perceptions of African Americans concentrated in urban areas. However, this reality does reflect national trends of lower incomes and de jure segregation.

These economic realities and disparities are rarely acknowledged for their effects on educational conditions and their implications for varied regions throughout the state. Although poverty and ethnicity in some cases, have been studied as rationales for differential educational performance of students (Greene, et. al. 2006), the effects of these realities on the educational resources or inputs are rarely examined. Teacher quality as a vital resource is recognized for its fundamental contribution to children's academic progress (Darling-Hammond, 2002; Ladson-Billings, 1994). Complex in nature, it is beyond the scope of this paper to examine the varied dimensions of teacher quality. Consistent with the economic stance taken so far, this paper examines teacher quality in terms of salary and National Board Certification as indicators of resources teachers bring to schools. Both are representative of the value placed on the education of students. Arkansas provides a ready forum to study this phenomenon of differences in teacher value with its large range of differences across the state. Historically and economically, educational attainment differs based on ethnicity and the systemic variables that are relevant to it. With this in mind, counties are compared based on two indicators of teacher quality, teacher salaries and National Board Certification. The three counties with the highest median incomes and smallest percentages of African American residents, (Benton, Saline and Lonoke) are compared to those with the lowest median incomes and the highest percentages of African American residents (Lee, Chicot and Phillips). The paper examines the differences in teacher quality, i.e., teacher salaries and National Board Certification, between these two groups.

"There" - Teacher Quality

Identifying the destination is instrumental to planning and making a trip. Here, the phrase, "it is not the destination but the journey," applies to some extent. One must determine the destination when making crucial trip-related decisions. A timeline that includes car time and stops, and gathering necessary resources based on destination and time. "Going camping" is a simple phrase but what does it mean? Camping out in one's own backyard is an outdoor experience, but it does not present the organizational, logistical and financial challenges of a camp-out in a park that one must cross five states to reach. This has implications for the preparations and the activities that occur at the end of the journey. Likewise, to address the

effects of centuries of exclusion, extensive preparations are needed for the "rough" and cumbersome terrain across years of systemic, entrenched racism. The sociohistorical context and varied positionalities of those defining the trip and the destination for the state of Arkansas make positionality especially pertinent.

In 2004 considerable attention was focused on the 50th anniversary of the Supreme Court's decision in Brown v. Topeka Board of Education (Bell, 2005; Orfield, Frankenberg, & Siegel-Hawley, 2016). Several reports described the gains or lack thereof of African American students over the 50 years since de facto segregation was made illegal. Although the 1954 decision called for desegregating schools with "all deliberate speed," it took until 1956 and a return to court to decipher this directive and push school systems to act on it. Many jurisdictions, including many in Arkansas, continued to resist the mandate (Gehring, 2004).

Opposition to desegregation of public schools (kindergarten to twelfth grades) in Arkansas entered the national consciousness when Governor Orval Faubus ordered the National Guard to prevent nine students from entering Central High School in Little Rock in 1957. At a symposium held in Little Rock in 2007 to assess progress made since the Central High School crisis, some attention was given to the role teacher quality played in the lack of progress (Tubbs, 2007). However, the families, backgrounds, values, and various attributes of students of African descent were noted as the culprits for lower levels of achievement (Tubbs, 2007).

Arkansas reflects national school trends in being essentially segregated with greater concentrations of people of African descent in the most economically depressed areas and residents of European descent in the more affluent areas. Areas with a majority of African American students have lower levels of educational achievement and resources. Lake View is one of those areas.

Lake View is a small school district in southeastern Arkansas with virtually 100% of its students claiming African American heritage. In 1992, Leon Phillips, the superintendent in Lake View school system filed a lawsuit (*Lake View School District v. Governor Mike Huckabee*) against the state of Arkansas to bring attention to the inequity in the allocation of resources in education and to effect changes in the funding formula for public education across the state.

After a long litigation, the state was directed to address the inequities. The court's ruling in 1994 ordered the state to address the resource allocation problem in a timely manner. However, it took over ten years before the Arkansas legislature met the dictates of the edict and devised an acceptable statewide plan (Gehring, 2004). This landmark decision clearly delineated systemic issues confronting Arkansas education, but these are ignored or dismissed in discussions about the discrepancies in achievement scores within and among school districts. Among the changes that may significantly impact educational outcomes in Arkansas is the adjustment to teacher salaries.

Teacher quality is recognized as fundamental to students' success (Darling-Hammond, 2002). This is particularly true for students of African descent (Gay, 2018; Ladson-Billings, 1994). With the adoption of the No Child Left Behind (NCLB) Act (2002), this verity acquired the status of an imperative. The stated objective of NCLB was to eliminate achievement gaps among groups of students by promoting an increased emphasis on reading and mathematical ability. A major element of meeting this goal was providing a "highly qualified teacher" in every classroom. A highly qualified teacher is one who: (1) has a baccalaureate degree, (2) is certified in the content area in which he/she teaches, and (3) passes tests in the content area (NCLB, 2002).

Difficulty in recruiting educators with requisite training is extremely challenging for districts in which a majority of the students live at or below the poverty level. This contributes significantly to the misconception of a teacher shortage. Given the perceived shortage of qualified, practicing educators, states have adopted alternative methods of licensure in order to meet this mandate. Alternate licensing programs are a means to rapidly increase the pool of teacher by allowing a person with a baccalaureate degree to seek certification in a content area. Those receiving alternative licensure usually work in the lower socioeconomic areas where traditionally licensed teachers are less likely to live and teach. The result has been a disproportionately high number of alternatively licensed educators manning classrooms in these schools. There is a scarcity of research on the effectiveness of these educators. Mixed results are reported that appear to be based on one's ideological stance (Darling-Hammond, 2002). The alternative measures are condoned based on the perception of a "teacher shortage." The more likely situation is not a teacher shortage but a shortage of educators willing to teach in certain areas. Traditionally, formally prepared and licensed educators prefer to teach in affluent Arkansas communities that pay higher teacher salaries. Consequently, those most in need of the 'best-prepared," "highly qualified" teachers as a means of addressing the achievement gap are least likely to have them. In Arkansas, this is certainly evident in how teachers are dispersed in the state and the variation in teachers' salaries.

In 1962, Gene Kelley's dissertation, "An analysis of White and Negro teachers' knowledge of good teaching practices," looked at a number of indices that measured inequality that persisted in the "dual system" after the Brown decision of 1954 (Kelley, 1962) Kelley's interests were in the "intangible" areas of education, i.e., teaching effectiveness as indicated in knowledge of good quality teaching practices - does this knowledge differ based on race of the educator? Although "tangibles" (facilities, salaries, books, transportation, etc.) were not a direct area of interest, Kelley recognized "it was impossible to divorce or isolate completely, the tangibles from the intangibles" (p.12). Different aspects of education, including teachers' salaries, were analyzed for their differences primarily during the period from 1952 to 1957. There were large and overt inequalities in salaries and compensation for those who educated students of African descent in Arkansas. Although this discrepancy persisted in 1960, it did decrease somewhat.

> The Arkansas State Department of Education reports that the average salary for Negro teachers in Arkansas for the school year 1959 - 60 was $3,110 compared to $3,434 for white teachers. The differential between Negro and white teachers *(sic)* salaries decreased from 395 in 1952 to 172 in 1960, a decrease of fifty-six per cent. (p. 20)

Similar to 1960 when these teachers were studied, disparities in teachers' compensation remain but they are largely based on *who* is being taught rather than on *who* is teaching. As a result of the Lake View decision, teacher salaries were reviewed by state legislators. They found Arkansas ranked 43rd on the American Federation of Teachers salary survey of 2001 (Richard, 2002). This review resulted in the state raising the minimum teacher salary to $28,711 in 2004. In 2018, teacher salary came under political scrutiny yet again, "Boosting teacher pay was a pillar of Hutchinson's re-election campaign and his legislative agenda…Under the legislation, first-year teacher with a bachelor's degree must be paid a minimum of $32,800 next year [2019 – 2020] and $36,000 by 2023." (Field, 2019). These are encouraging changes but there remains a large differential in salaries. As indicated in Table 1, Phillips County has the lowest household income and pays incoming teachers $38,246 (highest beginning salary for this county, see Table

2) as compared to the most affluent area, Benton, where the highest incoming salary is $44,750. Difference between these two is 14%. Desha County with a median income of $27,036 has an incoming salary of $32,125 – 28% difference from the highest incoming salary for Benton County. This discrepancy increases with time.

Table 1.

Comparison of Six Arkansas Counties on Teacher Salaries, and National Board Certification

County	Median Income	Percent of African Americans	Teacher Salaries		Number of National Board Certified Teachers*
			Beginning	Career High	
Benton	$61,271	1.6	$44,750	$74,105	59/10
Saline	$58,985	6.4	$38,580	$68,746	20/1
Lonoke	$57,290	6.0	$40,575	$62,475	22
Phillips	26,652	62.8	$38,246	$53,899	0/1
Desha	27,036	47.5	$32,125	$49,897	1
Lee	27,901	56.9	$32,660	$48,240	1

*Numbers as of 2008/Number in 2018

Table 2.

Salaries by School Districts for Six Arkansas Counties

County	School District	Beginning salary	Highest degree
Benton			
	Bentonville	44,708	71,121
	Decatur	31,600	48,225
	Gentry	35,000	55,768
	Gravette	41,300	66,585
	Pea Ridge	40,000	60,850
	Rogers	44,750	74,105
	Siloam Springs	39,500	58,207
Saline			
	Benton	36,425	61,529
	Bryant	38,580	68,746
	Harmony Grove	38,200	58,850
Lonoke			
	Cabot	40,575	62,475
	Carlisle	31,500	47,950
	England	31,000	48,899
	Lonoke	33,966	53,484
Phillips	Barton-Lexa	38,246	53,899
	Helena West Helena	36,246	53,816
	Marvell-Elaine	36,500	55,867
Desha			
	Dumas	31,000	47,150
	McGehee	32,125	49,897
Lee			
	Lee County	32,660	48,240

Source: Teacher Salary Schedule Analysis, Fiscal Year 2016 – 2017
www.arkansased.gov

For experienced teachers, the highest salaries are also in districts in higher socioeconomic areas. The top salaries ($74,105 to $62,475) are in Benton, Lonoke and Saline Counties; Phillips, Desha and Lee Counties, pay top salaries ($47,150 to $55,867) that range from approximately 36% to 25% less than their better endowed counterparts. This discrepancy is a crucial indicator of the value placed on the quality of education received by those in more affluent areas compared to those living in economically disadvantaged regions. The incentives and rewards are greatest for those who choose to teach in the more affluent areas. Almost 60

years have passed since Dr. Kelley's analysis of compensation and teacher quality, yet there remains a disparity in amounts paid to teachers of African American children.

A second critical resource disparity is the number of Nationally Board Certified teachers, an indicator of teaching excellence. The National Board for Professional Teacher Standards (NBPTS) certifies as master teachers those who "improve teaching and student learning" (http://www.nbpts.org). It describes National Board Certified Teachers as "highly accomplished educators who meet high and rigorous standards" (http://www.nbpts.org). Receiving NBPTS arises out of reflective process involving videos of teaching, artifacts of student work, delineation of goals and outcomes, and writing/reflecting on the processes. The certification process embodies the significance of reflection by requiring educators to critically examine why they engage in certain practices (rationale, purpose) and to what end (goals, expected outcomes). By becoming cognizant of their practices, they become more effective in their design and implementation. In addition to the honor associated with this certification, a state provides a monetary award in recognition of completing the arduous process. Within this area, poverty is noted as an area that warrants an additional reward - working in a high-poverty school and district (70% or more students are eligible for free and reduced-price lunch) nets a higher monetary award than educators who do not.

As with “highly qualified” teachers economic factors linked to the distribution master teachers in Arkansas, school districts with the highest salaries and/or largest populations tend to have the largest number of National Board Certified educators. Of the six counties compared, in 2008, Benton county had the highest number, 59 (third largest number for the state after Pulaski county's 110 and Craighead county's 64); there were 20 in Saline; and, Lonoke had 22 (M. Rowland, personal email, April 25, 2008). For the three majority African American counties, Lee had, and Chicot had one, and Phillips was one of six counties with none (M. Rowland, personal email, April 25, 2008). The list of NBCT list for Arkansas in 2018 reflects similar trends with Benton having 10 as compared to Phillips with one (Table 1). Again, the students in the most economically challenged, rural environments are not given privilege to the benefits of "improved teaching and student learning."

"Yet"…According to Positionality

Many believe the major work needed to realize educational equity has been accomplished given the legislation passed beginning with the 1954 Brown v. Topeka Board Of Education. However, the reality is a substantial part of the nation remains essentially segregated based in fact or in practice. This is clearly the case in Arkansas. The percentage of people of African descent is higher in Arkansas (16%) than the national average (12.8%), however, the state remains highly segregated with its African American population concentrated in a few areas. This concentration has serious implications for the educational processes within these areas.

Positionality has implications for how the issue of equity and outcomes is defined and addressed. The people directly affected by this controversy are rarely consulted for ideas and/or recommendations to address it. Reactions to the directive to change the inequitable funding formula resulted in the recommendation that districts consolidate so state-allocated funds can be used more judiciously. However, the weight of poverty is not alleviated by how this is done. Smaller and poorer school districts are consolidated either with similarly small or larger poorer

neighboring districts thereby further exacerbating the problem of inadequate resources (Richard, 2002).

Disparities in salaries for educators and the distribution of Nationally Board Certified educators remain. One, teacher salaries, is directly under the purview/control of the state; the other arises from the voluntary decisions of educators. How can educators either with this certification or with the requisite skills be encouraged to apply for this honor? This seems to reflect Kelley's focus on the intangible contributions to the classroom and how they are related to the tangible ones (monies and rewards). If the educators in the lower socioeconomic areas received this kind of preparation, practices would be enhanced thereby benefitting the students. These areas could be studied to ascertain their effects as opposed to the more prominent studies and their "formulas" for determining student success by accounting for economic status and race (Greene, et. al. 2006). Formulas for students of poverty have been proposed to offset or take into account these variables to determine district and teacher success (Greene, et.al, 2006). Because of the perception that home life, culture and socioeconomic status have direct bearing on intellect, measures that are most accepted are those that emphasize their influence. These measures have implications for the expectations and subsequent effort given to addressing the needs of students.

Conclusion

To better understand how teacher quality impacts educational outcomes, the dispersion of teacher salaries and master teachers across the state of Arkansas was examined. The disparities indicated in Dr. Kelley's dissertation of 1962 remain today with children of African descent and in poverty receiving less of the quality espoused as integral to address the achievement gaps. Positionality is indicated in that litigation and legislation that caused this issue to be viewed more systematically than individually was initiated by those maligned and most affected. Although knowledge about a student's home life and family might be relevant for instruction, it is the premise of this paper that these are often over emphasized and overshadow significant others.

Positionality is of importance because it recognizes the potential for flawed logic underlying "formulas" and variables selected to explicate this issue. Some of the prevailing explanations are based on the implied assumption or belief that people of color have a resistance or aversion to education. This is a residual of oppressive ideologies used to exclude students of color. More in line with African Americans and education is the following:

> My primary argument is that this indigenous and operative philosophy of learning and schooling was capable of developing and sustaining the desire for learning in a people for whom educational accomplishment was not necessarily linked to comparable rewards, primarily because education was so tied to the identity of African Americans as a free people. I further argue that this philosophy was passed on in both oral and written narratives and institutionalized in the school communities created by African Americans. …. For the slaves, literacy was more than a symbol of freedom; it was freedom. It affirmed their humanity, their personhood. (Perry, Steele & Hilliard, 2003, p. 13)

This quote embodies the bulk of my experiences with people of African descent.

To quote my mother, "nothing from nothing leaves nothing." Deficit perspectives are not effective for realizing equity. If the progress we seek in educational achievement is to be realized, we must move from the anxious, naïve, and privileged perspectives/positions that hold students' characteristics accountable for their success rather than those responsible for educating

them. Further investigation of the varied resources available to students based on positionality and the implications of these differences for educational processes are needed. When equitable resources/inputs to the schools are provided, measures of student achievement will be more viable.

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Appendix

[2]Demographic Information for Arkansas by County

County	**Total Population**	**Percent Black**	**Median Income**
Arkansas	18,352	26.4	38,532
Ashley	20,771	25.6	36407
Baxter	41,093	00.2	40,072
Benton	251,823	01.6	61,271
Boone	37,212	00.4	40,727
Bradley	10,994	29.3	36,310
Calhoun	5,194	22.3	37,225
Carroll	27,782	01.3	39,686
Chicot	11,008	54.2	32,412
Clark	22,495	23.9	37,144
Clay	15,190	00.7	32,219
Cleburne	25,361	00.6	42,312
Cleveland	8,332	11.0	44,840
Columbia	23,992	35.0	37,072
Conway	20,954	11.2	39,638
Craighead	104,246	13.4	45,672
Crawford	62,119	01.3	43,504
Crittenden	49,278	49.0	38,558
Cross	17,164	22.8	41,081

[2] Based on five year estimates – 2013 – 2017 American Community Survey

County	Total Population	Percent Black	Median Income
Dallas	7,585	40.3	35,794
Desha	12,094	47.5	27,036
Drew	18,620	28.8	36,092
Faulkner	121,282	11.4	50,316
Franklin	17,803	01.0	39,472
Fulton	12,092	00.3	36,051
Garland	97,994	08.2	41,672
Grant	18,076	02.9	49,968
Greene	44,197	01.0	45,566
Hempstead	22,154	29.6	38,701
Hot Spring	33,480	11.0	40,626
Howard	13,472	20.9	34,851
Independence	37,097	02.0	39,945
Izard	13,521	01.9	39,135
Jackson	17,429	17.0	32,783
Jefferson	71,373	56.4	37,630
Johnson	26,155	01.8	35,758
Lafayette	7051	37.9	32,500
Lawrence	16,777	00.9	37,603
Lee	9,614	56.9	27,901
Lincoln	13,885	31.4	38,873
Little River	12,494	20.5	36,963
Logan	21,802	02.1	37,982
Lonoke	71,568	06.0	57,290
Madison	15,907	00.6	42,894
Marion	16,374	00.2	36,113
Miller	43,760	24.7	41,862
Mississippi	43,534	35.1	36,417
Monroe	7,420	40.8	31,584
Montgomery	9,059	00.3	35,252
Nevada	8,528	33.4	36,995

County	Total Population	Percent Black	Median Income
Newton	7,898	00.0	38,134
Ouachita	24,378	40.9	32,136
Perry	10,320	02.3	46,168
Phillips	19,518	62.8	26,652
Pike	10,893	02.8	36,893
Poinsett	24,098	05.6	37,487
Polk	20,212	00.5	33,870
Pope	63,372	02.9	40,668
Prairie	8,309	13.4	41,244
Pulaski	392,848	36.1	48,850
Randolph	17,514	00.9	35,930
St. Francis	26,688	55.6	33,102
Saline	116,252	06.4	58,985
Scott	10,584	00.2	37,396
Searcy	7,925	00.2	36,716
Sebastian	127,362	06.8	40,932
Sevier	17,206	04.8	43,675
Sharp	17,041	00.6	31,792

Supporting English Learners and Their Families through Summer Learning

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Abstract

An intentionally designed summer intervention examined the potential positive academic impact such a program could have on English language learners (ELLs) in literacy and mathematics for rising kindergarten to rising seventh grade students. The teachers chosen for these students were endorsed in ESL and received additional professional development in preparation for the summer intervention. The participating students were all identified as ELLs. Post summer intervention student state assessment scores were compared to a control group of ELL students that did not partake in the summer intervention. There were statistically significant findings in mathematics in favor of the students that completed the summer intervention. Teacher and student anecdotal comments are incorporated to further reflect the positive impact the program had on ELL students.

Introduction

As she shuffled through attendance slips, the summer coordinator's nods turned to shock. "I knocked on this one's door last night!" she exclaimed. "The door's about to fall off, but I kept knocking until someone answered. They know she needs to be here." This response was common from the summer coordinator, a kindergarten through fifth grade instructional facilitator at the elementary site that hosted a summer learning program tailored to meet the needs of English learners (ELs). Her persistence in promoting attendance at the summer program—whether conducting home visits, speaking to parents over the phone in their native language of Spanish, or speaking to neighbors and friends of the family—was an integral part of its success.

The summer coordinator has seen firsthand the persistent achievement gap in both reading and mathematics that exists between ELs and their non-English learner peers. This persistent disparity needs to be thoroughly examined and intentional interventions put in place due to the increasing number of ELs in public schools (National Center for Education Statistics [NCES], 2013; NCES, 2018; Carlo et al., 2004). The school district where the summer coordinator works hosted the summer program to intervene on behalf of its EL population. The district has 47% of its student population as limited English proficient. For the 2017-2018 school year, the Hispanic population was 45.9%, the Pacific Islander population was 11.7%, and the Asian population was 1.6%. These students may also experience an additional barrier to achievement based on socioeconomic status, as ELs disproportionately come from low socioeconomic homes nationwide (Alexander, Entwisle, & Olson, 2007; Kieffer, 2010). The student population for the school district has 71% of its population considered low-income.

One of the greatest disparities for disadvantaged students can be traced to children's out of school experiences (Alexander et al., 2007). As Pitcock notes, when public schools are open, "students of different income levels achieve at roughly the same rate" (2018, p. 5). Summer school is a way for students to lessen the amount of time they are in an out-of-school learning environment. Researchers McEachin, Augustine, and McCombs further support effective

summer programming as a way to combat what they term "the summer slide" (2018, p. 10). Our projects examine the issue of "the summer slide" in relation to ELs. The University of Arkansas in Fayetteville (UA) is the lead agency for OELA-Office of English Language Acquisition federally funded grants CONNECT (Creating Organized Networks Needed to Effectively Increase Early Childhood Teacher Performance) and SOAR (Strategically Organized for EL Academic Results). Our projects are actively working to address bridging the gap between ELs and their English-as-a-first-language peers through focused summer school intervention for students.

In accordance with existing research, we found several aspects to be crucial to the implementation of our summer program, like small class sizes, alignment to student needs, high quality instruction from well qualified teachers, and practices to create a positive site culture and maximize participation and attendance (McEachin, Augustine, & McCombs, 2018; Augustine, McCombs, Schwartz, & Zakaras, 2013; Cooper, Charlton, Valentine, Muhlenburck, & Borman, 2000). This article briefly describes the considerations in designing the summer program and selecting students. We then incorporate our analyses of the data into three larger categories that were components of success for our program: (1) student-centered curriculum and instruction; (2) methods that reduce the affective filter; and (3) family and community participation. A description of the data analysis methodologies follows. Finally, we provide conclusions and implications based on our statistical analyses. These strategies, and their subcomponents, could be replicated in future summer programs for ELs.

Summer Program Design

The summer program described in this case study was a two-week program of intensive literacy and math instruction. Students were selected using data from their English Language Proficiency Assessment (ELPA), Measures of Academic Progress (MAP), and Benchmark Assessment System (BAS) scores. As students were selected for the summer intervention, an effort was made to aggregate data for control students who were also English learners at the same school and in the same grade level as those students who attended the summer program (see Table 1). Students who scored at the beginning and intermediate levels on the ELPA were selected to participate. The students' MAP and BAS scores were not only used as a baseline for data analysis comparisons after the completion of the summer school, but were also used as a foundation for creating curricula tailored to the needs of the students in the program. During the program, students received instruction in classes of no more than eight students, and had at least 35-40 minutes of instruction in math, reading, and writing. The anecdotal comments are incorporated into the relevant suggestions from the literature about summer programming below.

Table 1
Demographics of Students in Summer Program

Grade Level & Group	N	Hispanic	Hawaiian/ Pacific Islander	All Other Demographic Groups	Males	Females
K-Treatment	13	76.9%	23.1%	0	38.5%	61.5%
K-Control	15	93.3%	6.7%	0	66.6%	33.3%
1st-Treatment	20	55.0%	40.0%	5.0%	65%	35%
1st-Control	31	67.7%	32.3%	0	29%	71%
2nd-Treatment	20	55.0%	45.0%	0	55%	45%
2nd-Control	21	38.1%	61.9%	0	52.4%	47.6%
3rd-Treatment	16	68.8%	31.3%	0	50%	50%
3rd-Control	29	62.1%	37.9%	0	48.3%	51.7%
4th-Treatment	16	62.5%	37.5%	0	31.3%	68.75%
4th-Control	15	60%	40%	0	53.3%	46.7%
5th-Treatment	18	44.4%	50%	5.56%	50%	50%
5th-Control	17	58.8%	41.2%	0	64.7%	35.3%
6th-Treatment	11	90.9%	9.1%	0	36.4%	63.6%
6th-Control	11	63.6%	36.4%	0	27.3%	72.7%
7th-Treatment	26	15.7%	42.3%	0	61.5%	38.5%
7th-Control	19	84.2%	15.8%	0	36.3%	73.7%

Student-centered Curriculum and Instruction

Small Class Sizes

Based on an evaluation of summer programs in six urban districts in the summer of 2011, Augustine, McCombs, Zakaras, and Schwartz recommended students should be in small classes or groups (2013). They found that teachers might find large class sizes challenging, even with a second adult in the room. Similarly, Cooper and his colleagues found that summer programs with small group or individual instruction had the greatest effect on student performance (2000). Our summer program corroborated those findings, with students in kindergarten through seventh grade in classes of no more than an eight-to-one student-teacher ratio. Anecdotal evidence from

teachers within our program were in agreement with Cooper's recommendation for small class sizes in summer school. Teachers commented that the instructional design with small groups allowed them to tailor instruction to the individual needs of each students and that response time of the teacher to individual needs tends to be much quicker in a smaller group.

Aligned to Student Needs

The curricula for our programs was created based on student needs. Several state-regulated assessment data sets were used to determine needs of instruction for students, as well as their previous grade level teacher's input for areas of growth. Using the information gathered from those sources, the site-specific summer coordinators worked with project staff to adapt and create curricula to fit the needs of the targeted students. The literacy curricula that were developed were adapted from commercially available and tested curriculum, and incorporated features to improve learning like small group reading and time to write based on reading (Augustine, McCombs, Schwartz, & Zakaras, 2013). Teachers were trusted, as professionals trained in ESL, to monitor and adjust the curriculum in real time in response to student learning needs.

Qualified Teachers

Research suggests that teacher quality is a strong determinant in school quality and student learning (Rivkin, Hanushek, & Kain, 2005), yet teachers trained and certified for instructing ELs consistently continues to be an area of teacher shortage (NCES, 2018). The educators selected to teach in the summer school were experienced teachers who went through an application and screening process before they began in the program. To apply, the teachers had to be ESL endorsed and licensed to teach in their subject area. The project directors conducted observations in the applicant's classroom of the applicant's instructional methods prior to approval to teach in the summer school. The observations focused on the teacher's use of instructional strategies and assessments that benefit ELs. As Goldenberg notes, ELs require additional instructional supports to achieve current academic standards (2014).

Coaching

Teachers were asked to choose an area of focus for observation based on the instructional practices and discourse elements from the Culturally Responsive Instruction Observation Protocol (Powell, Cantrell, Correll, & Malo-Juvera, 2017). Project staff observed the teachers during the summer school to gain more insight into specific classroom methodologies used by teachers. Following Knight's Reflective Teaching model (2013), teachers that volunteered to receive coaching met with trained project staff coaches. The coaches implemented Knight's model in structured conversations to improve the teachers' culturally responsive instruction. All teachers that received coaching indicated through surveys and verbal feedback that; 1) the focus area of coaching was relevant to them, 2) they would have something they could apply in their classrooms in the fall, 3) the time spent with a coach was adequate and meaningful, and 4) they would choose a coaching option again if given the opportunity.

Methods to Reduce the Affective Filter

Results from a randomized field trial suggest that voluntary summer school programs can help improve learning for students from high-poverty schools on the condition that students have regular attendance in the program (Borman & Dowling, 2006). Project staff and teachers actively worked to reduce the affective filter of students to maximize participation and attendance through a variety of ways, like the summer coordinator's home visits before the program started. Considering affective learning needs for English learners means "minimizing barriers to learning and resulting frustrations" (Rao & Torres, 2016). For our projects, this included providing meals, grouping strategically, and giving the students small gifts.

Hungry kids have a much more difficult time learning because basic needs are not met (Aleshire, 2017). Breakfast and lunch were provided to the students every day. In a district where the poverty rate is 71%, many students do not have access to regular meals outside of school. The students were given balanced nutrition at mealtimes and could take home any extra food.

Students were placed in small, homogeneous groups by reading level so students could have focused interventions. The groups of students could have equal access to participation in activities with class sizes of no more than eight students. These students could identify with each other on an academic level. Survey feedback from the students indicated they enjoyed the small class sizes and felt better prepared for the upcoming school year.

The Educational Renewal Zone associated with University of Arkansas, Fayetteville partnered with our grants to provide attendance reward baggies. Students received a gift bag for every day of their attendance. These baggies contained small gifts of candy, erasers, pencils, bookmarks, and Razorback© paraphernalia. The summer coordinator reached out to the local Barnes & Noble Bookstore to obtain a book of the student's choice for each child that attended summer school as a gift for the last day and as a reward for its hard work during the program. As a result, attendance remained steady over the course of the program.

Parent and Community Participation

Research into parent involvement is becoming more refined in order to delineate the various types of parental involvement and measures of student academic achievement (Fan & Chen, 2001). Recent research suggests family involvement is positively linked to children's academic outcomes (Weiss, Lopez, & Rosenberg, 2010; Wilder, 2014; Van Voorhis, Maier, Epstein, & Lloyd, 2013). There is general agreement within the research on at least two categories of family involvement: learning activities within the home and learning activities within the school (Tang, Dearing, & Weiss, 2012). Our projects supported opportunities for both categories of family involvement. Project staff and community members met with students and their families during Parent and Child Together (PACT) time prior to summer school. During the meeting, two groups from the community gave informational presentations multilingually about local resources available to culturally and linguistically diverse families. Then, to support learning at home, parents and students received backpacks filled with bilingual, grade-level appropriate books in their native language and multiple activities the parent and student could do together at home.

One factor in low parent involvement for ELs may be barriers in communication and access (Barrueco, Smith, & Stephens, 2015). The projects sought to reduce these barriers through parent liaisons and bus routes. Project staff conducted phone calls and home visits to recruit and

enroll targeted students. Bus routes were provided to better enable students to attend summer school. Parent liaisons contacted families in their home language if a child was absent or if a teacher wanted to communicate to a parent about a student. Additionally, open lines of communication between project staff and families was a crucial part of the success of the summer school, from enrollment to implementation.

Methodologies

As described in the summer program design section, students' ELPA, MAP, and BAS assessment scores were collected and analyzed to establish treatment and control groups of students before the summer program began. Teachers collected student work on assignments and formative assessment in class during the summer program. On the last day, students completed a survey in which they were asked to rate their experience using a Likert scale with pictures that matched their emotions on a scale of one to four. Students were also asked what they liked about the program, what they would change, and what they learned. In addition to this data collection, teachers completed a survey rating the success of the program and providing responses to open-ended questions. In the fall following the summer program, students' MAP scores were collected and analyzed using paired samples t-tests to compare the means between treatment students' test administrations for all grades except Kindergarten, who did not take the MAP assessment as part of their Pre-Kindergarten program. Independent samples t-tests were also conducted to compare the means of the treatment to the control students on the post-administration of the MAP. For test statistics that were significant, effect sizes (Cohen's *d*) were calculated using the formula $d=|t|/\sqrt{N}$ for paired samples *t*-tests and the formula $d=(M_2 - M_1)/SD_{pooled}$ for independent samples *t*-tests. Due to the simultaneous triangulation of data and the in depth nature of the analysis, these results are validated. Analyses of these data are included in the conclusions section below.

Conclusions

Summer school may be an effective intervention to help improve instruction and learning for all students, especially English learners with a two-fold challenge—learning a new academic language and coming from a low socioeconomic home. Preliminary findings (see Tables 2 and 3) from our projects show potential, with a statistically significant, small effect size in first grade math when comparing pre- and post-treatment scores (p=0.038, d=0.498); statistically significant, medium effect size in third grade math (p=0.040, d=0.659); and statistically significant, large effect size in sixth grade math (p=0.038, d=0.97) between the control and treatment groups after the summer school intervention. Although scores were statistically significantly different for second and third grade reading, this difference existed between the treatment and control groups before the summer program intervention and continued after.

Table 2

Paired samples test statistics comparing post-intervention to pre-intervention administrations

Grade Level	Mean	Std. Deviation	*t*	df	Sig. (2-tailed)
1st-Reading	0.600	4.535	0.592	19	0.561
1st-Math	3.250	6.528	2.226	19	0.038
2nd-Reading	1.950	8.611	1.013	19	0.324
2nd-Math	1.050	6.134	0.765	19	0.453
3rd-Reading	-0.375	7.310	-0.205	15	0.840
3rd-Math	-0.500	8.140	-0.246	15	0.809
4th-Reading	-2.800	5.185	-2.091	14	0.055
4th-Math	-1.600	5.974	-1.037	14	0.317
5th-Reading	0.600	13.410	0.173	14	0.865
5th-Math	2.313	5.016	1.844	15	0.085
6th-Reading	0.455	5.260	0.287	10	0.780
6th-Math	1.900	6.951	0.864	9	0.410
7th-Reading	2.308	12.506	0.665	12	0.518
7th-Math	-1.250	8.201	-0.682	19	0.504

* Kindergarten students did not take the MAP before summer school, so no data is available for this statistic.

Table 3

Independent samples test statistics, treatment-control

Grade Level	*t*	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
K-Reading	1.167	19.3	0.258	3.938	3.376
K-Math	1.288	26	0.209	4.974	3.863
1st-Reading	-0.100	48	0.921	-0.350	3.492
1st-Math	0.012	49	0.991	0.040	3.464
2nd-Reading	2.894	39	0.006	9.271	3.203
2nd-Math	1.988	31.8	0.057	6.836	3.484
3rd-Reading	2.180	40.5	0.035	7.584	3.479
3rd-Math	2.117	43	0.040	6.412	3.029
4th-Reading	-1.144	50	0.258	-4.674	4.084
4th-Math	-0.245	50	0.807	-0.799	3.258
5th-Reading	-0.608	31	0.547	-3.600	5.916
5th-Math	-0.536	32	0.596	-2.618	4.883
6th-Reading	-0.413	20	0.684	-2.182	5.285
6th-Math	-2.225	19	0.038	-9.109	4.094
7th-Reading	1.330	41	0.191	4.763	3.582
7th-Math	-0.612	39	0.544	-2.029	3.314

As noted in the article, "The Case for Summer Learning," reading tends to be a more organic part of a child's out-of-school life and parents gravitate toward reading with their children (Pitcock, 2018). On the other hand, math knowledge and skills tend not to be reinforced out of school to the same degree as reading. Qualitative data also reflected high self-efficacy for students in specific math and reading skills after the summer school, as well as high self-efficacy for teachers in implementing culturally responsive teaching methods and assessments for English learners.

Educators, administrators, and researchers looking to strengthen or start summer programs to reduce the "summer slide" should keep in mind the ideas of implementing student-centered curricula and instruction, reducing the affective filter, and engaging families and community groups. Specific supports for English learners can augment a program's success,

such as the coaching of culturally responsive teaching strategies and incorporation of multilingual family and community members. Being persistent, like our summer coordinator, helps too. Average daily attendance for students' grades kindergarten through seventh was 133 students, due in large part to constant contact by project staff with EL families to get students to school and learning. After missing the first day of the summer program, the student the summer coordinator visited attended regularly. The student wrote with enthusiasm she felt excited about summer school because she wanted to see the teachers and she learned about sight words. Moving forward, our research will continue to focus on improving instruction for English learners by providing professional development and coaching to teachers, while examining the specific components of the summer school program that lead to success for our students. In sharing our research, we hope to encourage others to purposefully design and plan summer programs, and to reflect, examine, and research the factors that contribute to success for English learners.

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A Tale of Two None-conventional Approaches to Teach Cultural Competence to Preservice Teachers: Examples from the Republic of Turkey and the United States of America

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Introduction

Preservice teachers are increasingly required to accommodate diverse students' population in their future classrooms. Furthermore, national and state standards require that preservice teachers demonstrate adequate understanding of their students' differences and make instructional decisions accordingly (He & Cooper, 2009). Consequently, teacher education programs utilize a wide range of strategies to help teacher candidates to teach and interact effectively with different learners. The goal of these strategies is to ensure that teachers can address the needs of all students, understand their own worldviews and to be responsive to the health, beliefs, cultural, and linguistic needs of their students (Banks, 1994; Bennett, 1993; Gillette & Boyle-Baise, 1995; Nieto & Rolon, 1995). Many scholars argue that despite the importance of teaching cultural competence, it is one of the most overlooked areas in the field of training (Saha, Beach, & Cooper, 2008; Adler & Gundersen, 2007). Furthermore, cultural competence cannot be learned successfully by reading books or taking quizzes due to the scope of culture aspects such as students' age, gender, disability, income level, education, and geographical location. Therefore, for preservice teachers to become culturally competent, they are required to learn about the culture elements they function in to effectively teach diverse students.

Although researchers have examined different approaches to teach cultural competence such as using reflection and field experiences, other researchers argue that these strategies lack a systematic integration of many of cultural aspects in many teacher programs (Banks, 1984; Bennett, 1993; Helms, 1984; Villegas, 1991; Zeichner, 1993, Prater, Wilder, & Dyches, 2008). Therefore, this study proposed two different none-conventional approaches to teach cultural competence to preservice teachers from the Republic of Turkey and the United States of America.

Literature Review

Cultural Competence

The literature presents different approaches to teach cultural competence. For example, while some researchers consider that teaching cultural competence must include the interaction between knowledge, values, attitudes and understandings of different groups, other researchers argue that cultural competence must evolve over time and to be closely related to one's own culture, including the interactions of the individuals with others to develop dynamic and complex learning environment (Siwatu, 2007, Sue, 2001, Lynch, & Hanson,1992). Based on this view, modelling effective communication and constant interaction between preservice teachers and

their different elements of their environment are essential components for teaching cultural competency. For instance, the use of modelling performance-based art projects, outdoor activities and the participation in multicultural events can enhance students' cultural competence (Sue, 2001). Engaging in such cultural activity projects can also help preservice teachers to develop awareness about other cultures and overcome their individual biases. Therefore, the participation in such activities should allow students to develop cultural awareness and integrate these practices into their classroom daily routines (Kirmayer, 2012; Diller, & Moule, 2005, Gay, 2000). Further, researchers proposed other activities to teach cultural competence to teacher candidates such as local dances and drama activities. These activities allow students to explore other cultural aspects, solve communication problems, develop self-confidence to bridge differences between communities and learn about the habits of different cultures (Doğan, 2008; Brown, 2007, Güzeloğulları & Ertural, 2006; Siwatu, 2007, Bişgin, 2001).

Project-based Learning

Project-based learning (PBL) is a teaching strategy that focuses on student-directed investigation (Blumenfeld et al., 1991; English & Kitsantas, 2013). The main foundation of PBL is the constant interaction and active participation with peers. Through this strategy, students engage in projects by articulating questions for investigation, designing plans, collecting and analyzing information, and creating a product of their understanding (Blumenfeld et al., 1991). The core emphasis of PBL learning is allowing students to interact and communicate with their peers during working on their project and to engage in reflective and critical thinking about what is being learned (Barrows, 2000; Bereiter & Scardamalia, 1989; Torp & Sage, 1998). Therefore, project-based learning is considered an important learning approach that may support the improvement of students' communication skills during projects execution (Blumenfeld et al., 1991; English & Kitsantas, 2013; Sungur & Tekkaya, 2006).

Theoretical Framework

Self-efficacy

The present study adopted Bandura's Social Cognitive Theory (SCT) as a theoretical framework (Bandura, 1986, 1994 &1997). Bandura' SCT emphasized the importance of behavioral imitation and modeling as the most effective strategy to teach new behaviors, compared to teaching by persuasion or observation. Therefore, Bandura takes a broad view of learning and recommends constant interaction between three different factors for successful reciprocal causation model: behaviors, personal factors and the environment. Although, Bandura does not suggest that the three factors in the model make equal contributions to the new behavior, he believes that people learn through observing others and by attending to the consequences of their own actions. Therefore, Bandura defines self-efficacy as "the beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments (Bandura, 1997). These beliefs affect the way people interact, communicate, make choices, the efforts they put into completing tasks, their will and resolve when difficulties arise, and their skills to cope with difficult situations. An important argument in Bandura's construct is

that self-efficacy is not about the number of skills people possess but what they can accomplish with those skills under different situations.

Theory connection to study framework

Grounded in Bandura's Social Cognitive Theory, this study proposes a theoretical framework model that predicts the interplay between three elements in preservice teachers' environment (learning environment, personal factor, and their personal behaviors). According to SCT, by immersing students in their new learning activities and taking an active role in the process of learning (project-based and cultural activities), students expect to model and imitate the new culture skills leading to better understanding and mastering the new cultural competence. Figure 1. Conceptualizes the theoretical framework model based on Bandura's Social Cognitive Theory

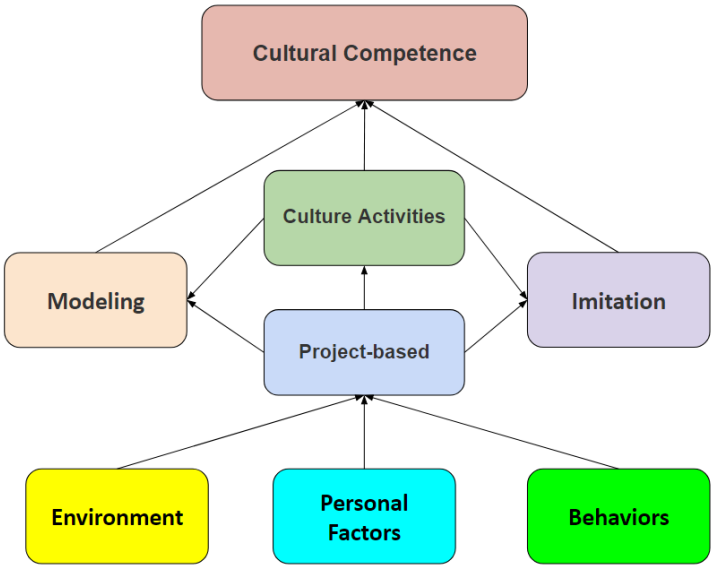

Figure 1. Theoretical framework model based on Bandura's Social Cognitive Theory

The purpose of the research

In the light of prior research, the purpose of this study is to examine the effect of the cultural activities and project-based learning (PBL) on preservice teachers' cultural competence.

Research questions

Research questions guiding this study include:

1. Does project-based learning strategy improve preservice teachers' cultural competence?
2. Does project-based learning strategy improve preservice teachers' self-efficacy to identify the needs, design activities and communicate with diverse learners in their future classrooms?

3. Open-ended questionnaire was used to inquire about preservice teachers' perception after engaging in cultural activities

Method

This study employed mixed method from two different universities, Ankara University (Turkey) and Arkansas Tech University (USA). The qualitative method used in this study was an open-end questionnaire with students in Ankara University (Turkey) to ask about the effects of cultural activities they engaged in on their cultural competence. The quantitative method used a within-subject design to examine the effect of project-based instruction on improvement of preservice teachers' cultural competence at Arkansas Tech University (USA). The projects used in the US experiment were designed to teach preservice teachers' different cultural competence such as accommodating students with special needs, identify the needs, design activities and communicate with diverse learners in their future classrooms.

Participants (USA)

Participants in this study were preservice teachers enrolled in college of education, Arkansas Tech University. Students were 69-participant with demographics as following: 8-male, 61-female, 4-Asian 10-Black / African American, 6-Hispanic / Latino, 49-White / Caucasian. Students reported that their age as the following: 47- age between 18-21, 10-age 22-25, 6-age between 26-30 years, 4-age between 31-40 years, 2-age 41or over. All participants were fluent in English.

Participants (Turkey)

Students participated in this study from Ankara University were preservice teachers enrolled in college of education. Participants were 52 preservice teachers, 32 were female and 20 were male. Students were majoring in social studies, special education and pre-school. Students spent about 6 hours a week for about 6 weeks to investigate about different Turkish regions, costumes, traditions, daily life practices and their traditional folk dance.

Materials (USA)

Students at Arkansas Tech University engaged in project-based learning using technology to learn about communicating with, design activities for and identify the needs of diverse learners. The materials were released to students with the related projects every week. Students read a chapter or online materials or watch a video or screencast before class (at home). During project-based activities, the instructor dedicated most of class time for hands-on projects and students' collaboration. Students completed projects with the guidance of the instructor and the support of their peers. In this method, the instructor utilized collaborative and inquiry learning approach and students had the opportunity to interact and communicate with peers through direct interaction or by posting online questions to the instructor or their peers.

Materials (Turkey)

Students at Ankara University attended social activities during the 6-weeks experiment time such as social clubs and folk dance activities. In preparation for the folk dance activities, students were free to select to study about different Turkish regions, their culture, costumes, traditions, music, lifestyles and history. Students attended about 6 hours per week working on these activities through reading, interacting with other students and reviewing different multimedia materials related to different Turkish regions. Instructors emphasized the importance of collaboration between all participants in all activities. The final project was a folk dance performance represents different Turkish regions presented at the end of the semester.

Instrumentations

For students at Arkansas Tech University, the instrumentations consisted of the following items:

Demographic survey. The demographic survey was to collect information about the participants' makeup, such as gender, age, major and race.

Self-efficacy survey. This survey was a 3-question 11-level Likert scale to assess students perceived self-efficacy based on Bandura's "Guide to the construction of self-efficacy scales" in Pajares & Urdan (2006). The measure was tailored to assess students' ability to integrate technology in their teaching to enhance cultural competence. The scale ranges from "Cannot do at all" at zero to "Highly certain can do" at 100 and it was administered at both the beginning and the end of the study. Students were asked to answer how confident they were in their belief that they have this ability". For example, students were asked: "Before engaging in technology integration in teaching and learning in your content area: How certain that you can design and teach technology enhanced learning activities that connect content standards with student technology standards and meet the diverse needs of learners. Rate your degree of confidence by recording a number from zero to 100 using the scale given below". Participants could rate their confident by selecting a number starting from zero "Cannot do at all" to 100 "Highly certain can do". Students were asked the same question at the end of the semester.

The initial ratings of the measure indicated that all items adequately reflect and assess the topics covered in this experiment and the scores averaged across the 3 items. Mean for the total sample M = 86.00, SD = 9.30, range = 7.38. The investigators calculated the inter-rater reliability of the measure by intra-class correlation coefficients to evaluate the consistency of the ratings. The reliability for the measure Cronbach's alpha (an estimated of internal consistency) was .90. Furthermore, the investigators used this measure of self-efficacy assessments in other classes related to teaching preservice teachers (face and construct validity). Finally, the investigators examined the measure's scale results and scale results of other concepts in the courses such as computer- assisted instruction, virtual classroom and course management system, and found that the results of this measure significantly correlated with the results in other concepts and Cronbach's alpha was .92 (criterion-related validity).

For students at Ankara University, the instrumentation used was an open-ended questionnaire to solicit about students' experience during the cultural activities.

Procedure

Students at Arkansas Tech University completed at the beginning of the semester a demographic and self-efficacy surveys related to their abilities to communicate, design activities and to identify the needs of diverse learners. Second, the instructor used the project-based method to teach 10 topics in 10 consecutive weeks. At the end of the semester, students completed again self-efficacy survey.

Students at Ankara University attended the cultural and folk dance activities 6 hours a week for 6 weeks. At the end of the semester, students completed an open-ended questionnaire to reflect on their academic, social and cultural experiences during the cultural activities.

Results

Prior to the main analyses, the data was screened for normality, out-of-range responses and systematic patterns of missing values. The investigators found that the data is normally distributed with no apparent patterns or clusters emerging. The three questions included in this analysis include: Students' ability to communicate with diverse learners, the ability to design activities for diverse learners and the ability to identify the needs of diverse learners.

Quantitative Analyses

First question. Does project-based learning strategy improve preservice teachers' self-efficacy to apply cultural competence in their future classrooms?

To answer the first question, investigators conducted paired samples t-test to compare students' mean of self-efficacy to apply cultural competence before and after engaging in project-based method. Results showed that mean of students' self-efficacy to apply cultural competence in their future classrooms after the project-based teaching ($M = 247.68$, $SD = 43.46$) was statistically higher compared to their self-efficacy level before engaging in the PBL activities ($M = 172.46$, $SD = 73.55$) at the .001 level of significance ($t = 8.08$, $df = 68$, $n = 69$, $p < .001$, 95% CI for mean difference= 75.22, SD= 77.36. On average, students' self-efficacy difference was about 27.681 points more after project-based teaching method. As displayed in Table 2, there are statistically significant differences, at the .001 significance level. Tables 1 and 2 summarize results from paired-samples t-tests performed for the same groups of participants.

Table 1

Descriptive statistics for students' self-efficacy to apply cultural competence based on PBL activities

	Mean	N	Std. Deviation	Std. Error Mean
Self-efficacy to apply cultural competence After	247.68	69	43.46	5.23
Self-efficacy to apply cultural competence Before	172.46	69	73.55	8.85

Table 2
Results of paired samples statistics for students' self-efficacy based on PBL activities

	Paired Differences							
				95% Confidence Interval of the Difference				
	Mean Diff	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Self-efficacy to apply cultural competence After-Before	75.22	77.36	9.31	56.63	93.80	8.08	68	.000

Note: S*tatistically significant differences at p .001 significance level*

Second question. Does project-based learning strategy improve preservice teachers' self-efficacy to identify the needs, design activities and communicate with diverse learners in their future classrooms?

To answer the second question, investigators conducted paired samples t-test to compare the mean of students' self-efficacy before and after engaging in project-based activities on three areas (communicate with diverse learners, design activities for diverse learners and identify the needs of diverse learners).

Results of the paired-samples t-test showed that mean of students' self-efficacy to identify the needs of diverse learners after the project-based activities (M = 80.29, SD = 15.9) was statistically higher compared to their self-efficacy level before engaging in the PBL activities (M = 57.68, SD = 26.91) at the .001 level of significance (t = 6.76, df = 68, n = 69, p < .001, 95% CI for mean difference= 22.61, SD= 27.79. On average students' self-efficacy difference was about 22.61 points more after project-based teaching activities.

Results also showed that mean of students' self-efficacy to design activities for diverse learners after the project-based activities (M = 84.20, SD = 15.38) was statistically higher compared to their self-efficacy level before engaging in the PBL activities (M = 56.52, SD = 26.34) at the .001 level of significance (t = 8.14, df = 68, n = 69, p < .001, 95% CI for mean difference= 27.68, SD= 28.24. On average students' self-efficacy difference was about 27.68 points more after project-based teaching method.

Finally, results showed that mean of students' self-efficacy to Communicate with diverse learners after the project-based activities (M = 83.19, SD = 15.48) was statistically higher compared to their self-efficacy level before engaging in the PBL activities (M = 58.26, SD = 25.89) at the .001 level of significance (t = 7.52, df = 68, n = 69, p < .001, 95% CI for mean difference= 27.68, SD= 28.24. On average students' self-efficacy difference was about 24.93 points more after project-based teaching method.

As displayed in Table 4, there are statistically significant differences, at the .001 significance level, before and after engaging in PBL activities. Tables 3, 4 and figures 2, 3 and 4 summarize results from paired-samples t-tests performed for the same groups of participants.

Table 3

Descriptive statistics for students' self-efficacy to respond to three different cultural competence based on PBL activities

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Self-efficacy: Identify the needs of diverse learners (After)	80.29	69	15.901	1.914
	Self-efficacy: Identify the needs of diverse learners (Before)	57.68	69	26.186	3.152
Pair 2	Self-efficacy: Design activities for diverse learners (After)	84.20	69	15.378	1.851
	Self-efficacy: Design activities for diverse learners (Before)	56.52	69	26.336	3.171
Pair 3	Self-efficacy: Communicate with diverse learners (After)	83.19	69	15.482	1.864
	Self-efficacy: Communicate with diverse learners (Before)	58.26	69	25.893	3.117

Table 4

Results of Paired Samples Statistics for students' Self-efficacy to respond to three different cultural competence based on PBL activities

		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean Diff.	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	Identify the needs (After) – (Before)	22.609	27.794	3.346	15.932	29.286	6.757	68	.000
Pair 2	Design activities (After) – (Before)	27.681	28.240	3.400	20.897	34.465	8.142	68	.000
Pair 3	Communicate (After) – (Before)	24.928	27.527	3.314	18.315	31.540	7.522	68	.000

Note: S*tatistically significant differences at p .001 significance level*

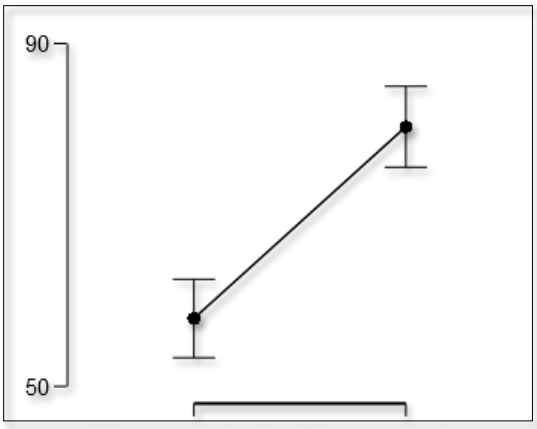

Figure 2. Students' ability to identify the needs of diverse learners (before and after)

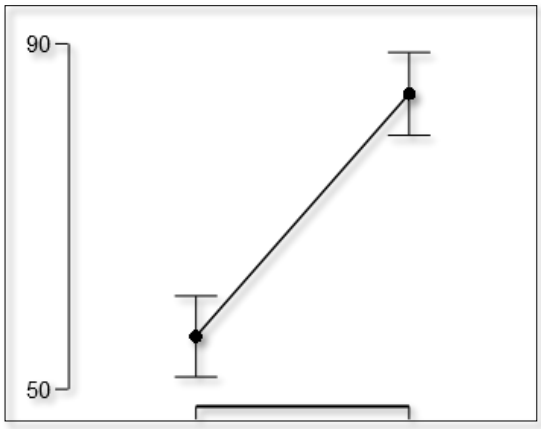

Figure 3. Students' ability to design activities for diverse learners (before and after)

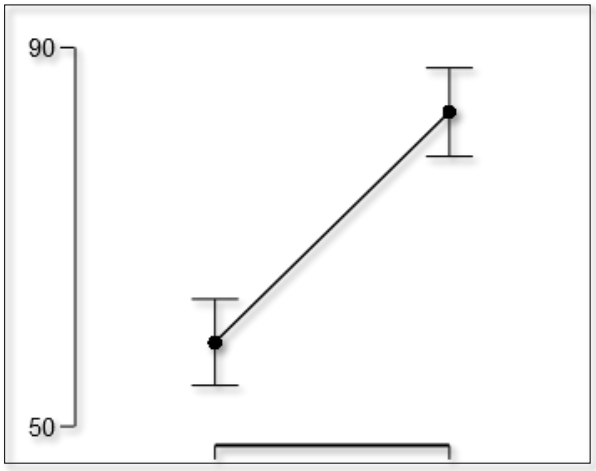

Figure 4. Students' ability to communicate with diverse learners (before and after)

Qualitative Results

Narrative descriptions were developed from open-ended questionnaire data and then coded using an open and axial coding system to identify codes, categories, themes, organized patterns and subcategories ground within participants' collected data. Further, the research questions served as a guide in the search for common themes and patterns and to utilize pathways, connections and interpretations of the information (Coffey & Atkinson, 1996). The literature was also analyzed to compile a comparative source of information depicting evidence of practice. Although, the findings were varied, the investigators found several overarching themes.

One common theme that emerged from the students' responses indicated that cultural activities and particularly folk dance were effective activity in improving their friendship with students from different cultures and contributed to enhance the social cohesion of the university. Most participants (32) mentioned that cultural activities helped them to make new friends from different cultural background in addition to building stronger friendship ties (16 students). Only 4 students stated that the cultural activities did not affect their relationship with others. Most of the participants (44) stated that taking a role in the folk-dance groups enhanced their sense of connection with other cultures. Before participating in folk-dance activities, students stated that their circle of friends were only limited to their narrow group, but through participation in the dance activities, their friendship circle was extended. Most of the participants (43) stated that their participation in folk dance activities made them more comfortable, active and positive about other cultures. Other students stated that after participating to folk dance activities they were able to spend more time with new friends and learn from each other.

Another common theme appeared from students' responses indicated that there was an overall positive influence of folk dance activities on the preservice teachers' cultural knowledge. For example, a significant number of the students (38) indicated that their participation in folk dance activities positively affected their knowledge about other Turkish cultural practices and removed their bias toward them. Regarding the effect of the cultural activities on students' cultural competence, most students (42) stated that joining folk dance events contributed to improvement in their empathy, respect to other cultures, and improved cultural knowledge about different Turkish regions that they never knew about before. Students stated that in addition to learn to dance, they learned about the history and practices of various Turkish regions, which will help them to teach about these practices when they become teachers in the future.

The final common theme emerged from students' responses was the positive impact of the cultural activities on them to become culturally responsive teachers. For example, majority of students revealed that the activities helped them to recognize and embrace the culture differences and therefore helped them to develop learning activities to accommodate different cultures and needs. Additionally, majority of students (36) mentioned that these activities provided an opportunity to understand their own identities as well others, resulting on richer perspective about their worldviews and cultural inclusiveness. Majority of the participants (45) stated that they could implement similar cultural activities in their own classrooms to teach their future students' different cultural perspectives. Figure 5 shows preservice teachers performing the folk-dance activities in Ankara University.

Figure 5. Four different photos of preservice teachers performing the folk-dance activities as part of learning cultural competence in Ankara University.

Discussion and Conclusion

This study presents the results of two different approaches used at Arkansas Tech University (USA) and Ankara University (Turkey) to teach cultural competence to preservice teachers. While preservice teachers at Arkansas Tech University engaged in project-based teaching strategy to learn about cultural competence, preservice teachers at Ankara University engaged in cultural activities and folk dance to learn about different cultures.

The main finding of this study is that the use of the PBL strategy does improve preservice teachers' self-efficacy to identify the needs, design activities and communicate with diverse learners in their future classrooms. This improvement was demonstrated by the statistically significant differences in students' self-efficacy scores across all questions after engaged in PBL activities. A possible interpretation of this research finding is grounded in Bandura's Social Cognitive Theory (1997) that the improvement in students' self-efficacy depends on the one's capabilities to organize and execute the courses of action required to produce a given task. These beliefs affect the way people make choices, the efforts they put into completing tasks, their will and resolve when difficulties arise, and their skills to cope with difficult situations. Consequently, students who engaged in the PBL were more curious to learn about diverse people and their needs and promote students' cognitive engagement and help them to interact more

efficiently with each other. Additionally, when students engage in active learning and taking an active role in collaborative projects, they model and imitate the new skills leading to better mastering the new cultural competence. This interpretation is consistent with prior research regarding the effectiveness of the PBL strategy on student learning due to the additional opportunities for students to model what they learn and collaborate with peers leading to deep learning (Demetry, 2010; Strayer, 2007).

In Ankara University (Turkey), the results of present study revealed that cultural activities and folk dance contributed to improvement of preservice teachers' cultural knowledge. Furthermore, these activities helped students to work closer with other students to learn about different cultures, communicate with their peers during the culture activities and learn together about diverse people, costumes and traditions. This interpretation is consistent with students' questionnaire reflections that folk dance activities have contributed to their social and intercultural development. This finding is also consistent with other research that indicated that peer interaction and collaboration is one of the most important factors for positive intercultural experience for teacher candidates (Terenzini, Lorang and Pascarella, 1981; Tinto, 1975, 1997, Karahan et al. 2005). Furthermore, Özdinç (2005) attested that preservice teachers who participate in socio-cultural activities showed improvement in their communication skills, tolerance to others and embracing differences. Similarly, Gökmenoğlu and Kiraz (2011) argued that it is important to provide preservice teachers with a platform to explore authentic cultural experiences and to encourage them to participate in social activities to help them improve their cultural literacy and learn about the world they live in.

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A Case Study on the Differences in Scores of Undergraduate Students in Traditional, Online, and Hybrid Classes

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Abstract

The purpose of this research was to ascertain whether there were variances in academic performance between students taking an educational technology course in traditional, online, and hybrid learning environments. As a secondary goal, the researcher assessed the differences in academic performance of male and female students. All students in this study held an undergraduate status of junior or above. They had earned a minimum of 45 hours and a minimum 2.75 overall GPA. The students were given identical instructions and rubrics for a WebQuest project. The results were analyzed through quantitative investigation of the students' scores for their individual projects. The WebQuest scores of 1,052 students were collected over 14 semesters (fall 2009 through spring 2016).

Introduction

The rapid growth in online education makes it vital to understand if there are differences in learning outcomes according to delivery mode. Since 2012 distance growth has continued its steady increase, while traditional class enrollment has decreased. The Babson Survey Research Group reported that online classes grew "by 5.6% from Fall 2015 to Fall 2016." (Seaman, Allen, and Seaman, 2018, p 3). Many studies have been conducted evaluating the final course grade of traditional students against that of online learners. Research on students' traditional classroom outcomes versus online class outcomes has generated unpredictable results. Some studies have assessed the equivalent exam performance of traditional classroom students versus online learning students and found no significant difference (Elvers, Polzella, & Graetz, 2003; Hemmati, Omrani, & Hemmati, 2013; Hollister & Berenson, 2009; Jensen, 2011; McGready & Brookmeyer, 2013; Stowell & Bennett, 2010; Summers, Waigandt, & Whittaker, 2005). This research study looks at performance results in one project of a single educational technology course. The study covers performance results in three types of classes (traditional, online, and hybrid) of the students of two different instructors.

Mosalanejad, Shahsavari, Sobhanian, and Dastpak (2012) discovered that even though there is no difference in practical test scores, nursing students' online-course scores surpass their traditional-course scores in an abstract examination. The researchers suggest that tests entailing memorization may be simpler online, possibly because of the students' ability to look up the appropriate answers. Scores on tests with abstract questions do not differ between the two types of learning modes. An analysis conducted at Georgia Gwinnet College (Kakish, Pollacia, & Heinz, 2012) found:

> No substantial difference between academic results between student performance in a traditional classroom and students in a hybrid class. Based on the results of their findings, they discovered that there was no significant difference between the performances of the two groups, with a 95% level of confidence. The data showed that students in the

> traditional sections perform slightly better than their counterparts in the hybrid sections, but the differences are not statistically significant. (p. 11)

As the use of the Internet for online and hybrid courses grows, higher education programs are struggling with their response to growing directives for accountability. The federal government wants accrediting organizations to supply evidence that students attain the expressed knowledge objectives (Suskie, 2004). Consequently, these powerful demands force instructors to record learning success, in addition to trying to continuously improve the learning results.

The growth of online and hybrid classes and of instructors' accountability requirements compounds the issue of providing quantitative proof of the success of online learning as compared to traditional classroom learning. This study investigates the academic results of traditional classroom learning weighed against that of online and hybrid learning. It focuses on the academic performances of students in traditional, online, and hybrid classes of two instructors, in a course in educational technology in a teacher education program. All results were derived using the same grading rubric for one specific technology project (WebQuest). The two instructors worked together to design the rubric and used identical instructional resources. This paper reviews the learning environment literature and investigates past studies on the effectiveness of traditional classroom learning as compared to online and hybrid learning. It then explains the research setting and the methodology. In conclusion, the results are presented and discussed to deduce critical concerns, lessons learned, and directions for research in the future.

Statement of the Purpose

The main purpose of this study is to ascertain whether there are any differences in academic performance between traditional, online, and hybrid-learning students who take the same educational technology course. As a secondary goal, the study assesses the differences in academic performance of male and female students in the same classes. The population sample of this research constituted upper-class undergraduate students admitted to the Teacher Education program, who chose to attend either a traditional, an online, or a hybrid class.

This research study compares traditional, online, and hybrid instructional modes of delivery of curricula by examining student performance on one specific WebQuest project. A similar study was conducted by Neuhauser (2002), who evaluated just two sections of the same course. Neuhauser analyzed the students' final grades from a traditional course and an online course. The same instructor taught the two sections using identical instructional resources. On comparing the final grades from the two sections, Neuhauser found no meaningful distinction, with the online students averaging only marginally higher. In comparison, this research will compare the final WebQuest project grades of 1,052 students in 48 sections of the same course taught in traditional, online, and hybrid classes by two different instructors using the same project, instructional materials, and grading rubric for assessment.

This quantitative, causal-comparative (ex post facto) study explores pre-existing differences in groups of individuals, where both the effect and the declared reason have occurred previously, and the study is in retrospect. The outcome dimensions measure the included students' final grade scores on one identical project required for an undergraduate educational technology class, with an identical rubric and the same two instructors grading all of the students' WebQuest projects in all three learning modes.

Review of Related Literature

Comparative research on the effect on student performance of traditional, online, and hybrid modes of learning has produced varied results. Some studies have returned positive or negative results, while others found little significant difference. The review focuses on research published between 1995 and 2016. Database sources, including ERIC and Academic Search Premier, provided sites for information retrieval, while Google Scholar offered the necessary interface to search the Internet for sites containing original texts. The review closely focused on 92 studies that compared traditional learning to online and hybrid learning.

Background

Access to higher education can be achieved in various ways. One way is to enroll in a traditional classroom program, which involves attending classes and accessing educational materials within the learning institution (Chen & Jones, 2007). Alternatively, students can enroll in an online program, whereby they complete schoolwork and communicate over the Internet, interconnected through various communication technologies. Some educational institutions may also blend the two by offering both traditional and online coursework in a hybrid or blended course. Arbaugh (2005) and Chen and Jones (2007) assert that most institutions of higher learning have adopted all three systems in their learning environments.

While most of the debate relating to the efficiency of traditional, online, and hybrid education systems revolves around student performance and satisfaction, other issues of concern to researchers relate to technical expertise, at both a personal and an institutional level. Personal technical issues include skill level and attitude of the student towards the educational system. Institutional issues relate to infrastructural development. A third area of discussion about the differences between traditional, online, and hybrid educational systems relates to flexibility, communication, interaction, learning, and skills development (Wills & Stommel, 2002).

Introduction to Traditional, Online, and Hybrid Learning

Traditional learning

Since the beginning of public education, traditional classroom learning has been the basic model. In this model, a typical university classroom environment involves a professor giving a lecture to students, who listen and take notes on the information offered by the lecturer. The crucial element of this mode as compared to online learning is that it provides a platform for interaction between the lecturer and the students. O'Malley and McCraw (1999) discovered that technological improvements leading to the advent of technological devices, such as mobile phones and computers, encouraged a shift in popularity from traditional classroom learning to online learning. They add that the most important technological discovery was the computer and the Internet. However, this shift did not mean that the traditional classroom lost its popularity in educational circles. Numerous studies (Kearns, Shoaf, & Summey, 2004; Maki & Maki, 2002; Maki, Maki, Patterson, & Whittaker, 2000) have found that students are more satisfied with traditional learning compared to online learning. Most research studies that compare traditional and online instructional modes of learning, using final grades instead of final exam scores, show that students in the traditional classroom receive higher scores (Asby, Sadera, & McNary, 2011; Jaggars, Edgecombe, & Stacey, 2013; Terry, 2007; Waschull, 2001).

Ashby, Sadera, and McNary (2011) report that students in traditional classes have higher final exam results compared to those in online and hybrid classes. Waschull (2001) found a trend toward higher final exam scores for students in traditional settings compared to those in online classes. Terry (2007) also showed that traditional-classroom test scores are higher than online-course scores.

There are studies, though, that have found evidence for higher final exam scores in online and hybrid courses compared to the same courses in traditional settings (Lim, Kim, Chen, & Ryder, 2008). Moreover, findings of no significant difference have been detailed in Russell (1999). Research in this area has yielded every possible conclusion.

Final grades, as opposed to final test scores, have not received as much attention in studies on academic differences in face-to-face, online, and hybrid learning. Here, the outcomes are less conflicting: most studies provide evidence for the superiority of the traditional method, although some investigations have found no meaningful difference in final grades between delivery modes (Akyol & Garrison, 2010; Kirtman, 2009).

Online learning

The origins of distance education can be traced back to the nineteenth century in continental Europe. The practice commenced with learning carried out through postal service correspondence (Freed, 2004). Much later, with the advent of the Internet and related technology, the same practice became web based. Online education occurs when teachers and students are geographically and technologically separated from one another, but connect for learning via the Internet. However, the distance between them is not defined, and need not be large enough to inhibit traditional classroom education. Freed (2004) suggests that online learning can occur when students and instructors inhabit the same learning institutions as well when students are located far away. Although video conferencing is closely related to the classroom experience, online learning has transformed learning into an anytime, anywhere experience. Online study can reach wider audiences and provide students an opportunity to study while still in their home or at work. It has internationalized education and addressed the barriers associated with human diversity factors, such as social, economic, or cultural background. The recent advancement in online learning has led several scholars to predict that the traditional mode of prearranged face-to-face classes will vanish in due course (Arbaugh & Duray, 2002; Hiltz, 1993; Kearns, et al., 2004; Maki & Maki, 2002).

Hall (2002) and Ponzurick, Russo, and Logar (2000) found that the enhancement of online learning was correlated with the advent of radio and other media that make distant communication possible. Computer-mediated learning technologies—such as video conferencing, online and offline video instructional learning, and two-way audio and video web-based communication—increase the possibility of success. Brown and Liedholm (2002) assert that although online learning has existed for a long time, it has yet to be universally incorporated into learning practices. Most of the challenges in the application of online learning relate to the quality or clarity of instruction compared to traditional classroom learning. Other questions associated with online learning are the relative cost of attendance, characteristics of the students, characteristics governing the efficiency of the instructions, and performance of the students. Studies on the efficiency issues have not provided answers to these queries (Noyes, Garland, & Robbins, 2004; Scheines, Leinhardt, Smith, & Cho, 2005).

Although faced with seemingly insurmountable opposition and criticism due to its reliance on expensive and complicated technology, online learning has proven to be superior in

terms of quality and student performance compared to traditional classroom teaching in some studies (Arbaugh & Duray, 2002; Wills & Stommel, 2002). Indeed, Lim, Kim, Chen, and Ryder (2008) discovered that students' test scores are higher in online classes than in traditional courses. Online learning generates the physical features of traditional education, such as lecture halls, which enable students to participate from anywhere they have access to a computer and eliminate the costs of commuting. In addition, from an environmental standpoint, students can access learning materials easily from technological data storage devices, such as flash drives and portable personal computers, instead of the hard-copy paper materials traditionally used in face-to-face courses. Furthermore, the internet has facilitated access to virtually all forms of learning materials and sources.

Hybrid learning

In hybrid or blended learning, students attend a traditional class part of the time and participate in an online distance education class for the remainder. A study at Central Florida University by EDUCAUSE Center for Applied Research found that "blended courses have the potential to increase student learning outcomes while lowering attrition rates in comparison with equivalent fully online classes" (Dziuban, Hartman, & Moskal, 2004, p. 5).

In 2011, researchers monitored 605 college students taking the same statistics course at six different public universities. One group took the course in a traditional classroom, while the other students took it in a hybrid format. The students were pre- and post-tested. The hybrid group performed marginally better, but this result was not statistically significant (Bowen, Chingos, Lack, & Nygren, 2012).

In another study involving a medical terminology course, the researchers compared traditional and hybrid courses using quantitative methods to determine student opinions and whether the two modes of course delivery met the course objective. Satisfaction was significantly stronger for students in the hybrid courses (Martin, Kreiger, & Apicerno, 2015). Gangone (2015) discusses the results of converting a traditional class to a hybrid format, comparing the hybrid students' performance results in a quiz to the two-remaining traditional-class students' performance results in the same quiz. Students in the hybrid section in most cases performed better than students in the traditional classes. Finally, a meta-analysis conducted by SRI International for the U.S. Department of Education in 2010 examined studies of hybrid learning from 1996 through 2006 and found that students in blended learning classes outperformed those in fully online or fully in-person classes (Means, Toyama, Murphy, Bakia, & Jones, 2010).

Research Design and Questions

Research design

This quantitative, causal-comparative design sought to determine the relationship between students' scores on one content-specific education project, a WebQuest. The study covered seven years of traditional, online, and hybrid technology in education classes, taught by two instructors at a regional university in the southwest United States. The independent variable was the individual students' score on the WebQuest project administered during semester, in a traditional, online, or hybrid class. The dependent variable was the dichotomous outcomes. Fourteen consecutive semesters from fall 2009 to spring 2016 of students' WebQuest scores provided the data for analysis. The students' scores were obtained from the two instructors, who

each taught four classes each semester. The scores used came from eight of each type of class (traditional, online, and hybrid) from the two instructors.

Research Questions

The research questions guiding the inquiry are:

1. Is there a significant difference in academic outcomes among undergraduate baccalaureate students engaged in traditional, online, and hybrid instruction?
2. Is there a significant difference in academic performance between genders in traditional, online, and hybrid instruction?

Methodology

The sample for this research project comprised upper-class undergraduate students enrolled in a required course in educational technology for a teacher education program. The students enrolled in the one-semester class, in traditional, online, or hybrid format. The same two instructors taught all three types of classes, using the same rubric to evaluate the same WebQuest project. The study compared the performance-related scores of each student on the assigned WebQuest project. Existing data on the scores of the project and on gender were collected from the academic records of both instructors.

The primary purpose of the study was to determine whether there are any differences in academic performance between students in traditional, online, and hybrid learning environments. As a secondary goal, it assessed the differences between male and female students in the different education environments.

Data Analysis

Since the study was ex post facto, the researcher used archival data recorded between the fall of 2009 and the spring of 2016. WebQuest scores of a total of 1,052 students over 14 semesters were collected. All students in this study held an undergraduate status of junior or above and had passed the certification test for state educators. They were also accepted as teacher candidates of the College of Education in the Teacher Education Department at their university. The students' scores were obtained from the two instructors who taught four of the classes each semester in all three formats (traditional, online, and hybrid). The scores used came from eight of each type of class from each of the two instructors.

The researcher entered the assessment data into the Statistical Package for the Social Sciences (SPSS), version 25, for data analysis with various statistical tools. To see if there was a significant difference between the WebQuest scores of students of the two different instructors, an independent samples t-test (hereafter, independent t-test) was used. This test compares the means between two unrelated groups on the same continuous dependent variable; for the purposes of this project, it indicates whether the WebQuest scores differ based on instructor, mode of instruction (traditional, online, or hybrid), or gender (male/female).

As there was no difference in mean academic performance between the students of the two instructors, the researcher combined the two datasets in order to analyze the research questions using a two-way ANOVA. The two-way ANOVA compares the mean differences

between groups that have been split in two independent variables, called factors. For example, a two-way ANOVA was used to understand whether there is an interaction between gender and WebQuest scores, where gender is the independent and WebQuest score the dependent variable. Research Question 2 asks if there are any differences in the academic performance of males and females among the traditional, and hybrid class students. Chen and Jones (2002) report that gender significantly correlates to student academic achievement in online learning. In addition, Alstete and Beitel (2004) found that females outperformed males in online learning classes. The first step was to test for significance of difference in academic performance between the students of Instructor 1 and Instructor 2, using an independent samples t-test. Although the assumption of normality is violated, the sample size is large enough that this is not a concern.

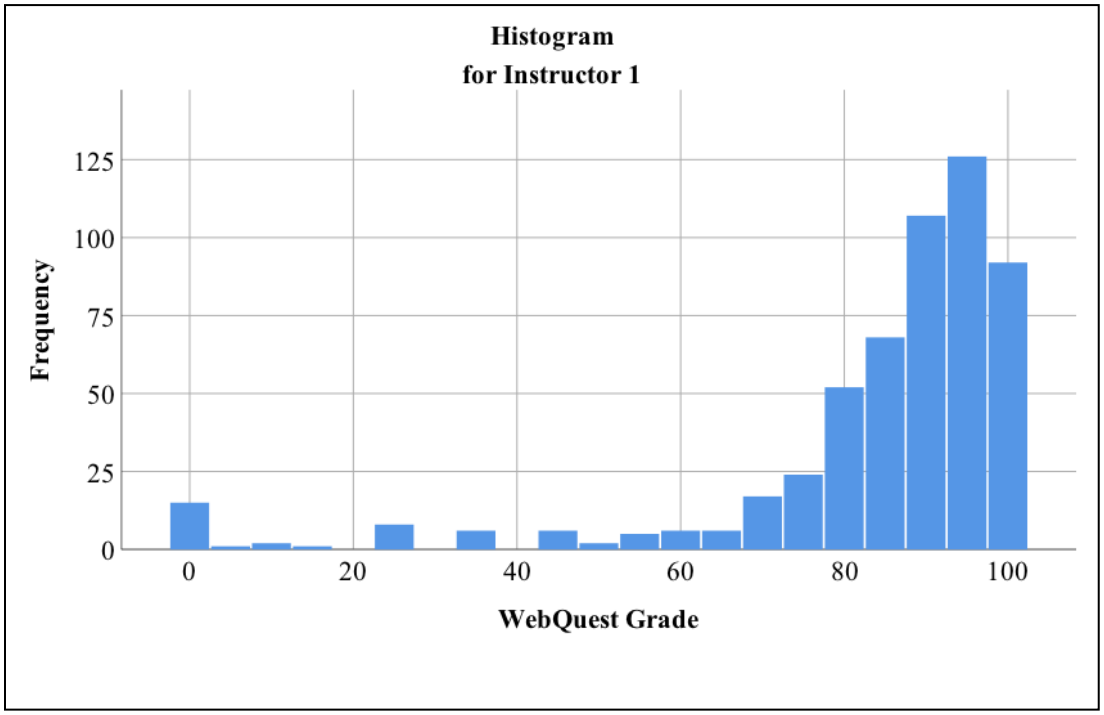

Figure 1. Normality Tested with Histogram for Instructor 1.

This histogram depicts the distribution of grades for Instructor 1. The data is basically normally distributed with some negative skew, which is typical for grades ranging from 0 to 100.

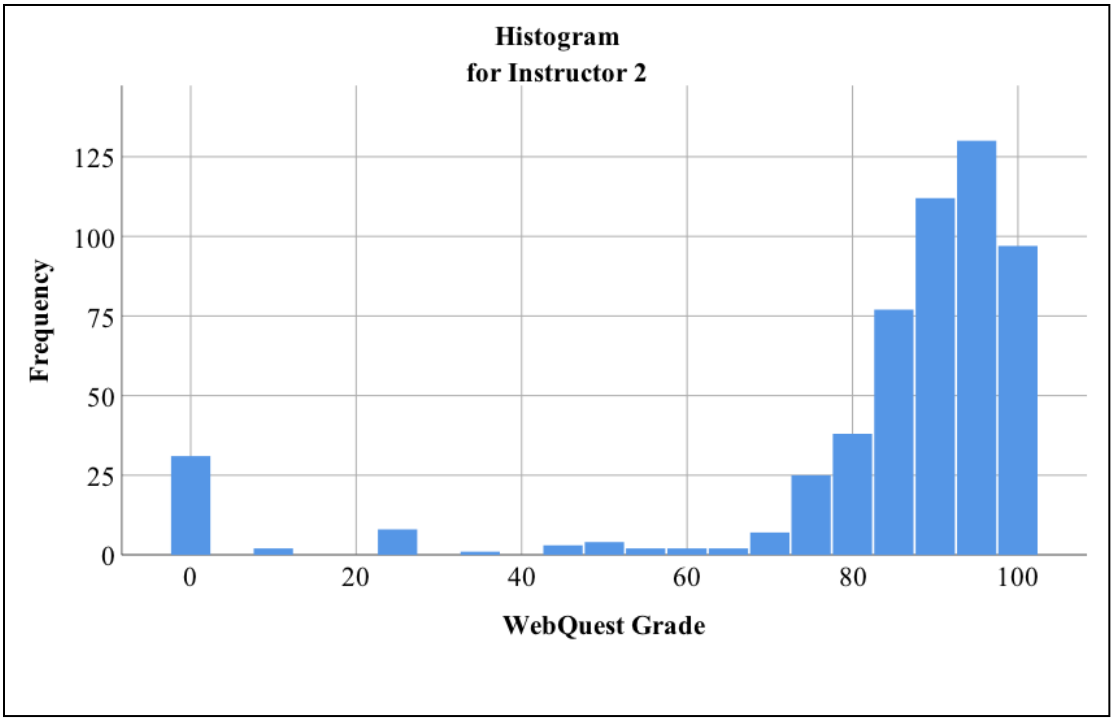

Figure 2. Normality Tested with Histogram for Instructor 2.

This histogram depicts the distribution of grades for Instructor 2. The data is basically normally distributed with some negative skew, which is typical for grades ranging from 0 to 100.

Table 1. Kolmogorov-Smirnov Test for Normality

Instructor	Test statistic	Df	p-value
Instructor 1	.22	544	<.001
Instructor 2	.28	541	<.001

This table shows that the distribution for grades by Instructor violates he assumption normality, but the histograms show that the violation is not severe. Although the assumption of normality is violated, the sample size is large enough that this is not a concern.

Table 2. Homogeneity of Variance: Tested with Levene's Test

Instructor	Mean	Standard Deviation
Instructor 1	83.86	20.98
Instructor 2	83.14	24.26

The results of Levene's test indicate that homogeneity of variance, is met, $F(1,1083) = 1.74$, $p = .19$. There was no difference in mean academic performance between instructors, $t(1083) = .52$, $p = .60$ (Table 4.2). Therefore, the researcher combined the two datasets in order to analyze the research questions.

Analysis of Research Questions Using Two-way ANOVA

The assumptions of the two-way ANOVA are:

1. Independent observations
2. Normal distribution: tested with Kolmogorov-Smirnov test, and histogram of residuals.

Table 3. Kolmogorov-Smirnov Test of Normality on Mode of Delivery

Mode	Test statistic	df	p-value
Traditional	.26	369	<.001
Online	.24	353	<.001
Hybrid	.26	363	<.001

This table shows that the distribution for grades by Instructor violates the assumption of normality, but the histogram shows that the violation is not severe.

Table 4. Kolmogorov-Smirnov Test of Normality on Gender

Gender	Test statistic	df	p-value
Male	.27	169	<.001
Female	.24	916	<.001

This table shows that the distribution for grades by gender violates the assumption of normality, but the histogram shows that the violation is not severe.

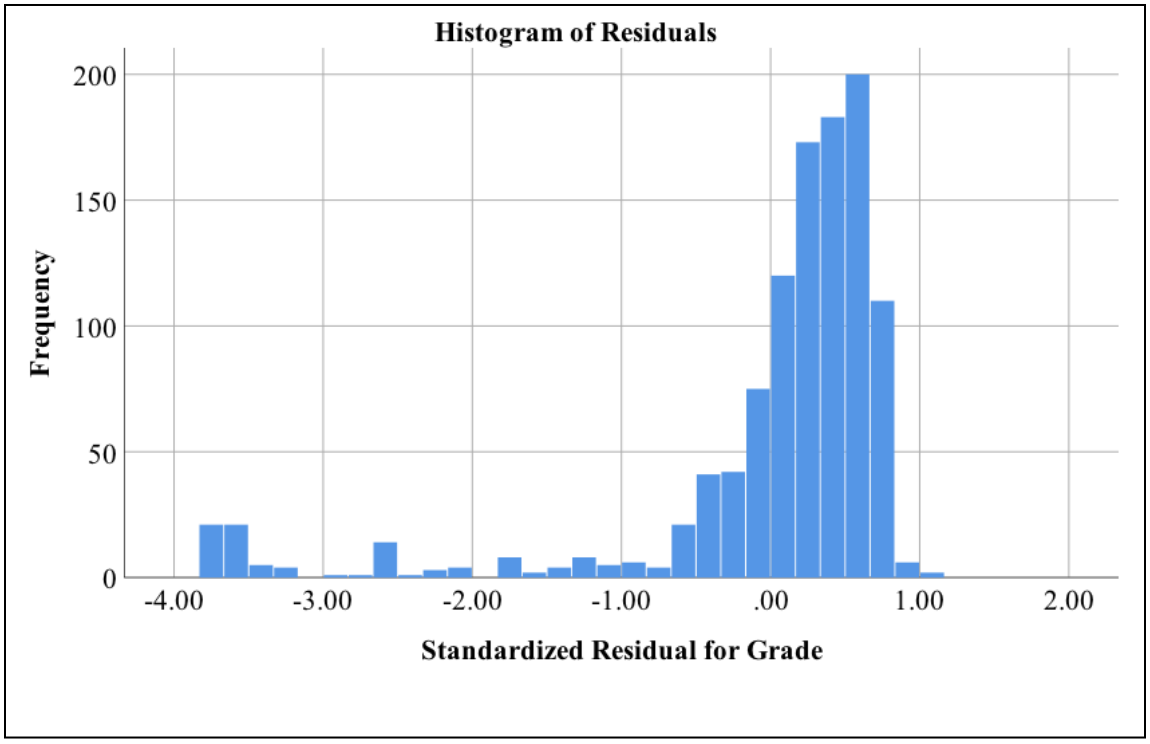

Figure 3. Histogram of Residuals

This histogram depicts the distribution of grades. The data is basically normally distributed with some negative skew, which is typical for grades ranging from 0 to 100.

Homogeneity of Variance: Levene's Test

Levene's test indicates that the assumption of homogeneity of variance is met, $F(5,1079) = 2.18$, $p = .06$.

Table 5. Results of Two-Way ANOVA

Source	SS	Df	MS	F	p-value
Gender	1042.76	1	1042.76	2.03	.16
Mode	1538.64	2	769.32	1.50	.22
Mode X Gender	502.17	2	251.08	.49	.61
Error	554237.04	1079	513.66		
Total	8122013.00	1085			

The results show there is no difference in academic performance by gender, F (1,1079) = 2.03, p = .16 (Table 4.7). Additionally, there is no difference in academic performance by mode of delivery, F (2,1079) = 1.50, p = .22 (Table 4.6). Finally, there is no interaction between gender and academic performance, F (2,1079) = .49, p = .61.

Table 6. Difference in Academic Performance and Mode of Delivery

Mode of Delivery	Mean	Standard Deviation
Traditional	82.10	24.63
Online	84.65	20.64
Hybrid	83.81	22.45

Table 6 shows the mean and standard deviation of the grades by mode of delivery.

Table 7. Difference in Academic Performance and Gender

Gender	Mean	Standard Deviation
Male	81.46	25.39
Female	83.88	22.12

Table 7 shows the mean and standard deviation of grades by gender.

Conclusions

A two-way ANOVA was conducted to determine the effect of the three types of course delivery—onsite traditional, online distance, and hybrid classes—on student performance. That is, it was used to test if there was meaningful variance in the scores on the WebQuest project according to mode of delivery or gender. No significant variance was detected, and this result supports the continued development of online instruction programs. The findings of this study illustrate that online learning has become an accepted alternative to traditional learning and can be just as effective as traditional or hybrid learning. Instructors should ensure that students receive the same curriculum for the same course whether it is an online or traditional course. While previous studies provided evidence that online students did significantly better than students in traditional classes (Means, et al., 2010; Shacher & Newman, 2003), it is possible that more self-motivated students are more likely to select online classes, as was found in a study of microeconomics classes (Gratton-Lavoie & Stanley, 2009).

Findings

This study found no difference in academic performance by mode of delivery, $F(2,1079) = 1.50$, $p = .22$ (see Table 4.6), and no difference in academic performance by gender, $F(1,1079) = 2.03$, $p = .16$ (see Table 4.7). It also found no interaction between gender and academic performance, $F(2,1079) = .49$, $p = .61$.

Discussion

Research suggests that teaching and studying online can be as effective as traditional instruction "when the method and technologies used are appropriate to the instructional tasks, there is student-to-student interaction, and when there is timely teacher-to- student feedback" (Moore, Thompson, Quigley, Clark, & Goff, 1990; Verduin & Clark, 1991). This study joins the growing body of research on the success of online learning. The lack of significant difference in results between the three modes of delivery (tradition, online, and hybrid) may indicate that all three modes are acceptable in teaching courses to students. All of the instructors of the educational course examined in this study worked closely together to ensure all their students received the same content regardless of the instructor or mode of delivery they chose. Universities and colleges need to conduct more research to verify that students in their traditional, online, and hybrid courses are making the same progress regardless of mode of delivery.

Suggestions for Future Research

Ultimately, research is needed on related issues outside the scope of this study. For example, retention and graduation rates may be related to mode of delivery. Additionally, research should take into account the methods used for teaching online and traditional classes. In addition, online students have more opportunity to cheat. The two instructors in this study had

the opportunity to observe the progress of the traditional and hybrid students as they wrote their WebQuest. Their online students, on the other hand, turned in their completed WebQuest with no observation of their work by the instructors.

The students involved in the current study were above average. These findings may thus not be generalizable to the larger population of students in traditional, online, and hybrid education classes. Despite these issues, the findings of this study are consistent with previous studies (Parsons-Pollard, Lacks, & Grant (2008).

Summary

The type of analysis used in this study should be carried out consistently by universities in order to pinpoint any differences between results in traditional, online, and hybrid courses that could signify inequalities in learning. As the number of students enrolled in online courses grows, it is important that more research be done to determine if online education is as effective as traditional education.

Online education has become a popular change from traditional educational classes. However, there are still questions as to its effectiveness. In a study that compares student learning outcomes in a microeconomics course, Brown and Liedholm (2002) found that students in the online format performed significantly worse on tests than the students in the traditional format even though they had better GPA and ACT scores.

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Mathematics Teaching: Constructivist and Non-Constructivist Beliefs of Preservice Teachers

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Abstract

This qualitative study explored the beliefs preservice teachers (PSTs) held about mathematics instruction prior to completing their mathematics methods course. Open-ended survey questions were given to examine PSTs' beliefs about mathematics teaching. The survey was administered to elementary and middle-level education majors during the first week of their undergraduate mathematics methods course. Specifically, we examined how their existing beliefs about mathematics instruction related to the four tenets of constructivism. Participants exhibited constructivist beliefs about teaching mathematics, but also expressed some traditional beliefs of mathematics instruction.

Introduction

Historically, mathematics teaching has reflected a direct instruction approach. Many adults may remember mathematics as the teacher solving problems on the board and then the students practicing similar problems. However, the National Council of Teachers of Mathematics (NCTM, 2014) emphasizes the necessity of students developing conceptual understanding prior to procedural fluency. Although this has been the position of the NCTM for multiple decades, not all mathematics instruction reflects this idea. In order to better prepare preservice teachers to emphasize conceptual understanding in mathematics instruction, we explored the beliefs held by preservice teachers regarding teaching and learning. Specifically, we examined how their existing beliefs about mathematics instruction related to the tenets of constructivism. The following question guided this study:

What are elementary and middle-level preservice teachers' beliefs about mathematics teaching and learning?

Theoretical Perspective

According to the NCTM (2000), mathematics instruction should prepare K-12 students for life and the workplace. To do this, the NCTM emphasizes the importance of learning mathematics with understanding using a constructivist approach, and therefore constructivism served as the theoretical framework for this study. Constructivism is based on the idea that learning occurs when people are active, experimenting, and doing, and in this process, they are constructing knowledge (Piaget, 1954; Vygotsky, 1978). The constructivist viewpoint is somewhat broad, including perspectives from Dewey, Piaget, Vygotsky, and Bruner, as well as many contemporary theorists.

Due to the multiple perspectives of this theory, Loyens, Rickers, and Schmidt (2007) identified four major assumptions that embrace the umbrella term constructivism. The first of these assumptions is learners construct new knowledge based on their personal experiences and

prior knowledge. Students modify and expand existing schemas (pieces of knowledge) when they interact or learn something new. Second, social interactions through cooperative learning help learners construct knowledge. Because learners' experiences and knowledge are different, they can better expand knowledge through collaborative work. Third, self-regulation is necessary for learner success. Constructivist teachers provide opportunities for learners to reflect and expect students to be responsible for their own learning and behaviors. The final assumption of constructivism is learning should involve authentic problems and scenarios, allowing students to solve real-world problems. For the purpose of this study, we will use the four tenets identified by Loyens, Rickers, and Schmidt (2007) to define constructivism.

Review of Literature

Pajares (1992) effectively sums up beliefs as a set of ideas determined by experiences, changes, and/or inferences. Beliefs can be influenced by a person's level of comfort, and this is especially true in teaching. These beliefs are often predetermined prior to entering their education courses in a teacher preparation program (Gresham & Burleigh, 2018; Gautreau, Brye & Lunceford, 2016). Beliefs are impacted by previous experiences as students, theoretical perspectives from pedagogy coursework, and field experience as preservice teachers.

Beliefs held by preservice teachers can be categorized by teaching, learning, instruction, and content. When studying the beliefs held by secondary education minors, Caukin (2017) found participants discussed more teacher-centered beliefs than learning-centered beliefs. In statements concerning pedagogy, several of the mathematics majors valued problem-solving and critical thinking of students; the participants explained critical thinking was more important than finding the correct answer. Some of the participants described a discovery approach to instruction, visualizing the role of the teacher as a facilitator while encouraging students to be creative in their solutions.

In many studies, preservice teachers report their beliefs are based on their prior experiences in school and what they learned about teaching from observing their teachers (Pajares, 1992; Jong and Hodges, 2013). Steele, Brew, Rees, and Ibrahim-Khan (2013) compared science versus non-science majors' beliefs about preparedness to teach mathematics. While their findings focused on participants' differences, the authors described the importance of students' background as more impactful on their beliefs about teaching mathematics. Sometimes negative ideas and beliefs about teaching are in place prior to entering their preparation program (Geist, 2010). Fields and Isbell (2018) found some teachers would not be swayed to try constructive approaches taught in their program, because they believed constructivist methods could not work for all classrooms.

Gresham and Burleigh (2018) sought to reveal perceptions of constructivist methods for teaching mathematics. Using a survey, journal responses to open-ended reflective questions, and interviews the researchers found the methods course had an impact on preservice teachers' beliefs and anxiety. The course instructors focused on preparing the teachers to use a variety of constructivist teaching methods, use precise mathematics language, and create a positive classroom environment. Results from the thirty-four participants suggested that each element influenced their changed beliefs. Reported changes from the interviews indicated new levels of improved confidence to try various strategies in their future classrooms. Additionally, the value of practicing the methods with children encouraged the use of constructivist styles of teaching.

In a similar study, Swars et al. (2018) focused on content knowledge and attitude changes through a specific course designed to encourage contextualized constructivist lessons. The Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) results "showed a significant increase across the program, revealing the teachers had significant increases in beliefs in their capabilities to teach mathematics effectively and influence student learning" (p. 132). They found the most significant changes occurred in the second semester, suggesting the length of immersion and experiences have a greater influence on preservice teachers' attitudes towards trying constructivist teaching methods.

Pedagogy coursework also impacts preservice teachers' beliefs about instructional methods. Overall, Swars et al. (2018) and Gresham and Burleigh (2018) discovered participants changes in beliefs were positive. The preservice teachers' enculturation of constructivist views become one of advocacy for learning through experiences, becoming a guide on the side not the sage on the stage. The methods courses gave them confidence to try new instructional strategies. Fields, Williams, and Isbell (2017) found both practice and theory impact preservice teachers' beliefs on teaching. The progression of change often begins as the preservice teachers' encounter field-based experiences, where the participants described themselves as both teacher and learner.

Methods

A qualitative content analysis (Krippendorff, 2004) of open-ended survey prompts was conducted to explore preservice teachers' beliefs about mathematics instruction. Preservice teachers enrolled in a mathematics methods course completed a series of several prompts to inform the instructor about their experiences with and beliefs about mathematics; however, only the following two survey items were used for analysis in this study:

1) Tell me about your favorite or best mathematics teacher.
2) What should a mathematics classroom look like? (Describe the roles of the teacher and students, what are they doing? Describe the physical setting, as well as the "feel" of the classroom).

This study was conducted at a small liberal arts university in a southern state of the United States. All participants were classified as seniors at the same university and answered the prompts in a Google Form survey during the first week of the semester they were enrolled in mathematics methods. Prior to taking the mathematics methods course, the participants had completed at least three collegiate mathematics courses designed for elementary and middle-level preservice teachers. Data was gathered over four consecutive long semesters, and 87 students participated in the study. Of the participants, 72 were seeking elementary licensure, and 15 were seeking middle-level licensure. Eighty of the participants were female, and seven were male.

Figure 1. List of codes for the content analysis of survey data.

The open-ended responses to two items on the survey were analyzed using provisional coding, meaning a list of codes was determined before the analysis of data, while still allowing for modification, deletion, or expansion of new codes during analysis (Saldaña, 2013). The codes used for content analysis of the survey data are displayed Figure 1. The following tenets of constructivist theories (Loyens, Rickers, and Schmidt, 2007) were identified as codes prior to analysis - authentic problems, construct new knowledge, cooperative learning, and self-regulation. Additional codes emerged during the analysis of data - non-constructivist views and explaining.

Findings

The tenets of constructivism served as the categories for the qualitative analysis of the open response survey, in addition to two categories that emerged during analysis of the data. The findings section is organized by the data analysis categories – cooperative learning, real world problems, construct new knowledge, self-regulation, explaining, and non-constructivist views. Pseudonyms designated by the researchers are used for the participants to protect their identities. Unless otherwise identified, all participants quoted are elementary pre-service teachers.

Cooperative Learning

Throughout the responses, group or collaborative work was mentioned 30 times by the participants. Terms like “community” and “team” were used to describe the environment of an ideal mathematics classroom. When discussing cooperative learning, participants emphasized the importance of group work and collaborations between teacher-student and student-student. A few participants described classrooms in which teachers and students should interact frequently, highlighting that teachers should learn from students as well as students learning from their teachers. Denise explained, “Both [teacher and students] are there to help the other improve.” The interactions, according to the participants, should reflect teachers and students working together to “explore mathematical concepts” and “to solve math problems.”

Several participants mentioned the need for a balance of individual and group work when learning mathematics. Believing students sometimes learn better from peers, Alexis a middle level education major said, “Group work is important to math, because if a student is struggling to learn from a teacher, then maybe a student would be able to better relate to another student’s explanation.” In order to build a positive classroom environment, Harper and LaPortia believed

"students being comfortable working problems in front of their peers" and "to ask for help when they need it" were important.

Real World Problems

When asked about their best or favorite teachers, participants often described how the teacher related mathematics to the real world. Games, projects, stock market references, field trips, class surveys, and career posters were some of the ways participants listed real-world connections. The need for relevant and real-life mathematics scenarios was coded 26 times in the data. Whitney highly valued real-world problems,

> Mathematics is everywhere one looks. I believe we can motivate the students to bring things outside into the classroom for mathematics. This will educate students on problem solving and caring for what is going on around the world. It will also help engage our students and let them enjoy the world of mathematics. It is very important for our students to be able to take their knowledge and understanding out in the world. Teacher's goals should be to educate the students through critical skills needed in everyday life.

Construct New Knowledge

Although no participants specifically said "constructing knowledge" in their responses, participants referenced the use of tools and manipulatives, experiencing learning through hands-on activities, and accepting multiple solutions to the same mathematics problems 48 times. Several participants emphasized the importance of students having access to manipulatives and tools in a mathematics classroom. According to LaPortia, "a math classroom should be full of resources and all kinds of different materials for students to work with," and Raquel believed "a mathematics classroom should be full of manipulatives."

Some participants also viewed the mathematics classroom as a place for students to experience through hands-on activities, "like science...with experiments, only math." These experiences should include project-based lessons, stations or centers, and discussion in which "students should be doing a good majority of the talking." Describing the teacher as a facilitator, Courtney, a middle level preservice teacher, discussed her ideal mathematics classroom,

> I want them to discover math with guidance. That is what I want our roles to be. I want them to be excited to uncover a new concept without me spoon feeding it to them. I want active, engaged math investigators for students. I want to be there as a guide, to help them stay on track and delve deeper. I know that my dream class is a bit Pollyanna-ish, but that is my vision.

Although it was only referred to a couple of times, two participants discussed accepting multiple ways to solve mathematics problems. When recounting their favorite mathematics teacher, Kathy appreciated "students did not have to solve problems the same way she did."

Self-regulation

Self-regulation was the least mentioned in the data and was only coded 11 times. When describing the role of the student, participants believed students should ask questions, listen, and use the resources provided to them. Only one participant mentioned the role of the teacher in helping students learn study skills. Debra reflected on the concept of mistakes, "I want to emphasize trying and taking risks. That is how most mathematics problems were solved. I like

the idea that failing a few times is a requirement in my class, because it means my students tried."

Explaining

The code explaining emerged during analysis of the data and was coded 26 times. The participants valued teachers who explained concepts clearly, provided several examples, and shared multiple methods to solving one problem. When referring to their favorite or best mathematics teacher, multiple participants simply mentioned how great the teachers were at explaining content, LaPortia went in more detail,

> She did a really great job of explaining the 'why' of everything. When we would learn about a new formula, she would teach use the formula and then go on to show us the background of where that formula came from and why that is the formula that does what we need it to do.

Using examples when explaining mathematical concepts was also appreciated by the participants, Mary shared, "my favorite mathematics teachers gave many examples of how to work problems before actually having us do it on our own and I learned best from him." Ben believed teachers should explain concepts in multiple ways, and "show students different ways to solve math problems...allowing the student to choose what works best for them."

Non-constructivist Views

Although many of the responses reflected the four tenets of constructivism, participants referenced what the researchers perceived as non-constructivist views fourteen times. Comments that did not reflect constructivist views revolved around direct instruction and traditional roles of teachers and students. Some participants made conflicting statements that incorporated both constructivist and non-constructivist views. A few participants believed a classroom teacher should be responsible for presenting the information through "lecture" or "direct instruction." Tabitha described this as, "the teacher should explain the concept being taught and then students should immediately practice." When discussing the roles of students and teacher, some participants viewed more traditional roles. Josie stated, "the teacher is the teacher and the students are the learners," and Kathy said, "it is the job of the teacher to provide the tools and knowledge for students to learn, and it is the job of the students to utilize what is provided of them." Some responses, like Britney's, incorporated both constructivist and non-constructivist ideals, "I do think that math needs more teacher instruction, not just guidance. But I think that students should also be able to figure some things out for themselves."

Discussion

The purpose of this paper was to examine preservice teachers' beliefs about mathematics teaching and learning, specifically in relation to constructivism. In some capacity, all four of the constructivist tenets were described throughout the participants' responses. Overall, the participants seemed to value cooperative learning, real-world problems, and the use of manipulatives and tools for hands-on learning. Self-regulation was not as prevalent in the data, but this could be due to the limitations of the questions asked.

Throughout the responses, participants highlighted the importance of teachers giving clear explanations, which led to some non-constructivist views regarding direct instruction and

traditional teacher roles. Like the findings from Jong and Hodges (2013), participants may be holding to more traditional beliefs about the roles of teachers and students. As they described their favorite mathematics teacher, participants often said the teacher was good at explaining. The participants rarely expanded on this thought. However, Alice articulated, "[the teacher] really helped me to understand how things worked and why they worked out the way they did rather than telling me how to do it." It is unclear if the concept of explaining was always used with a constructivist mindset. The participants' beliefs tended to be more teacher-centered rather than learner-centered, similar to the findings from Caukin (2017).

Participants mentioned their college professors and high school teachers more often than elementary and middle-level teachers when discussing their favorite or best mathematics teachers. One reason could be because they can remember more about recent learning experiences, so this may not indicate they are better teachers than elementary teachers. Although the question asked them to describe their favorite or best teacher, the responses clearly supported quality teaching.

The NCTM (2000) stated mathematics instruction should reflect constructivist ideals, and for the most part, participants were reflecting these components. It is important to note, some participants were incorporating ideas like real-world problems and manipulatives in their descriptions of mathematics teaching, but they still hung onto to some traditional views of mathematics. Years of learning mathematics in a traditional direct instruction classroom can make it difficult for preservice teachers to fully grasp constructivist views that embrace student discovery and construction of knowledge. However, elementary methods courses should encourage constructivist approaches to teaching and learning mathematics (Gresham and Burleigh, 2018; Swars et al., 2018).

Limitations

This small qualitative study provided the researchers with data to improve instruction in the mathematics methods course. Limitations existed due to the size and purpose of the study. Participants were only asked about their beliefs about mathematics at one point in time. The survey was not for a grade in the course nor was it initially intended for a research study, which may have caused short, less descriptive answers. Although this study was small and limited, it may still be valuable to others. Lincoln and Guba (1985) encouraged researchers to avoid generalizing data, instead they emphasized the importance of "transferability" and "fittingness." Meaning, teacher preparation programs and mathematics instructors may find this study valuable due to possible similarities in their programs and classes.

Implications

From the data collected, participants in this particular teacher education program are connecting the tenets of constructivism with mathematics instruction, but not fully embracing this approach to teaching. It is clear the mathematics college instructors are modeling constructivist approaches, since participants frequently mentioned their college professors in their responses. Yet, preservice teachers still need more experiences discovering mathematical concepts, as well as observing and facilitating K-12 students' discovery of mathematics concepts. In regard to constructivism, our teacher preparation program should place more emphasis on the role of the teachers and students, as well as collaborative work. While the

participants frequently focused on "teacher explaining," the mathematics methods classroom should highlight the role of students explaining rather than the teacher. As a program, we should emphasize the importance of promoting student self-regulation as a valuable part of the learning experience.

Collaborative work was valued by the participants, but it is unclear if they understood the difference between group work and cooperative learning. As teacher preparation educators, we need to model cooperative learning groups and discuss the characteristics that distinguish them from group work. Similar to the Swars et al. (2018) and Gresham and Burleigh (2018) studies, a next step could be to examine the perspectives after preservice teachers enter the classroom. This study leads to new research questions concerning how preservice teachers' beliefs change during the methods and internship semesters and what factors impact their mathematics teaching practice.

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