TRAUMATIC BRAIN INJURY: TEACHER TRAINING PROGRAMS AND TEACHER CANDIDATE KNOWLEDGE

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TRAUMATIC BRAIN INJURY: TEACHER TRAINING PROGRAMS AND TEACHER CANDIDATE KNOWLEDGE

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ABSTRACT

TRAUMATIC BRAIN INJURY: TEACHER TRAINING PROGRAMS AND TEACHER CANDIDATE KNOWLEDGE

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This study examines the level of training provided on Traumatic Brain Injury (TBI) in teacher training programs nationwide and how their institution’s current level of training impacts the knowledge of teacher candidates in the final year of their program. Research has shown teachers lack knowledge of the consequences of TBI and the related services students with TBI may require and that very little pre-service training regarding TBI is provided to educators. The current study revealed very little formal training on TBI being provided in teacher training programs. However, if provided, formal TBI training was more likely to be found within special education classes. Undergraduate students who received formal TBI training had significantly more knowledge of TBI than students who did not receive formal training.
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Introduction

Since 1990, students with traumatic brain injury (TBI) have been able to receive special education services under the Individuals with Disabilities Education Act (IDEA). Under IDEA, TBI is defined as:

an acquired injury to the brain caused by an external physical force, resulting in total or partial functional disability or psychosocial impairment, or both, that adversely affects a child's educational performance. Traumatic brain injury applies to open or closed head injuries resulting in impairments in one or more areas, such as cognition; language; memory; attention; reasoning; abstract thinking; judgment; problem-solving; sensory, perceptual, and motor abilities; psychosocial behavior; physical functions; information processing; and speech. Traumatic brain injury does not apply to brain injuries that are congenital or degenerative, or to brain injuries induced by birth trauma. [34 Code of Federal Regulations §300.7(c)(12)]

It is necessary for educators to know exactly what traumatic brain injury (TBI) is as well as how it differs from other conditions in order to facilitate long-term planning and treatment (Shaughnessy, Greathouse, Neely, & Wright, 2006). Though many schools are equipped to provide supports to students with TBI, additional staff training is necessary in order for these resources to be used effectively (Janus, 1994; Ylvisaker, 2005). Lack of educator knowledge along with misconceptions and inadequate training can have dramatic consequences on the support provided for students with TBI. Educator knowledge about TBI is not only lacking, but also plagued by misconceptions (Funk, Bryde, Doelling, & Hough, 1996; Mohr & Bullock, 2005).

The lack of educator knowledge can be due in part to an insufficient amount of research on effective programming strategies and instructional practices (Savage, DePompei, Tyler, & Lash, 2005). Strategies for addressing the lack of educator training
include providing training through workshops, professional training and development programs, or published literature (Blosser & DePompei, 1991; Janus, 1996; Shaughnessy et al., 2006). However, training in how to work with children with a TBI is rarely included in the curriculum of teacher training programs, and the absence of teacher preparation programs in this area can result in lack of knowledge and more misconceptions (Farmer & Johnson-Gerard, 1997; Funk et al., 1996; Janus, 1996; Mohr & Bullock, 2005; Tyler, 1997). Clearly, another strategy would be to include TBI training at the university level (Janus, 1996; Tyler, 1997; Ylvisaker et al., 2001). This study will provide a review of relevant TBI literature and then will explore the extent of formal training provided on TBI in the national undergraduate curricula as well as undergraduate student knowledge of TBI.
Review of Related Research and Literature

According to the U.S. Department of Health and Human Services, Centers for Disease Control and Prevention (CDC) a TBI is caused by “a blow or jolt to the head or a penetrating head injury that disrupts the function of the brain” (CDC, 2010, “Get the Stats on,” para. 1). The Glasgow Coma Scale is the most common measure of injury severity with scores ranging from 3 to 15. Higher scores represent more mild injuries and lower scores are indicative of increasing severity of injury. Yeates (2000) reports that although the majority of traumatic brain injuries are mild, a “good recovery” outcome recorded on the Glasgow Outcome Scale does not mean individuals will not experience some sort of lasting impairment or disability. Additional studies have shown that more severe brain injuries can negatively impact nonverbal IQ performance, learning strategies, and are associated with elevated rates of emotional and behavior problems (Arroyos-Jurado, Paulsen, Ehly, & Max, 2006; Yeates & Taylor, 2006).

However, despite the increased negative impacts of TBI, students with TBI continue to be under-served and under-identified within the school system (Glang, Todis, Thomas, Hood, Bedell, & Cockrell, 2008; Ylvisaker et al., 2001). The U.S. Department of Education reported that, in the 2008-2009 school year, TBI accounted for only .4% of students with disabilities served in the school system. This percentage does not seem compatible with the fact that nearly half a million TBIs that occur yearly in children ages 0 to 14 (CDC, 2010; Langlois, Rutland-Brown, & Thomas, 2006). One study found that even students who had been identified as having a brain injury and were receiving special
education services, were not receiving those services under the disability category of Traumatic Brain Injury (McCaleb, 2006).

Under-identification or misidentification of students with TBI also indicates a lack of awareness of their presence within a school. It is not surprising then that the need for staff training was identified as a primary issue in providing services to students with brain injuries (Farmer & Johnson-Gerard, 1997; Funk et al., 1996; Janus, 1994; Mohr & Bullock, 2005; Tyler, 1997). However, TBI is rarely included in pre-service teacher training programs (Janus, 1996; Ylvisaker, 2005).

Statistics and Pathology

According to the CDC, between 2002 and 2006, nearly 1.7 million people sustained a TBI annually in the United States. That number may be much higher because the number of people who sustain a TBI and receive no care is unknown. The CDC also reported, among children ages 0 to 14, TBI results in nearly half a million emergency visits. The CDC states that males ages 0 to 4 have the highest rates of TBI-related emergency department visits, hospitalizations, and deaths combined, but, in every age group, TBI rates are higher for males than females. Falls are the leading cause of TBI in children ages 0 to 4 and from 2002 to 2006, there was a 62% increase in fall-related TBI seen in emergency departments in children ages 0 to 14 (CDC, 2010). Yeates (2000) reports about 76% of injuries are mild, 10% are moderate, and 13% are severe. Mortality rates are lower among children than adults with a rate of approximately 20 per 100,000 (Yeates, 2000). Due to the high rate of survival following TBI, it is likely children with TBI will return to the school system following injury.
Yeates (2000) reports brain injuries resulting from a closed-head trauma are varied and diverse. Injuries can either be classified as primary or secondary. Primary injuries refer to injuries that are a direct result of the trauma. Examples include skull fractures, contusions, and lacerations. Secondary injuries occur indirectly from the trauma and include brain swelling, hypoxia, increased intracranial pressure, hematomas, and seizures. In children, brain swelling and cerebral edema (an accumulation of fluid and the resulting swelling) are the most common secondary injuries and most often result in severe disruptions to the relationships of blood, brain tissue, and cerebrospinal fluid within the brain. Disruptions to these relationships can have dramatic effects on an individual’s neurobehavioral functioning. Not only can closed-head injuries have immediate effects, but there are a variety of later occurring effects as well. White matter degeneration, cerebral atrophy and ventricular enlargement are late effects that can all result in the loss of function years after the initial injury has occurred. Both immediate and late effects can have distinct consequences on the academic and behavioral functioning of a child.

**Academic and Behavioral Consequences**

The Disability Fact Sheet No. 18, provided by the National Dissemination Center for Children with Disabilities (2006), lists the following areas as susceptible to change after sustaining a TBI: thinking and reasoning, understanding words, remembering things, paying attention, solving problems, abstract thinking, talking, behaving, walking and other physical activities, seeing and/or hearing, and learning. These findings have been confirmed, and it has also been established that deficits exist in the following domains: alertness and orientation, intellectual functioning, language skills, nonverbal
skills, attention and memory, executive functions, corticosensory and motor skills, academic achievement, adaptive functioning and behavioral adjustment (Arroyos-Jurado, Paulsen, Merrell, Lindgren, & Max, 2000; Yeates, 2000; Yeates et al., 2004). The broad range of consequences suggests children who sustain a TBI will not easily fall in a homogenous group. Rather, children with TBI can have any combination of deficits that result in numerous variations of outcomes affected by variables such as severity of injury, post-injury environment, and developmental factors (Yeates, 2000). Ylvisaker et al. (2001) add that variability in preinjury ability, medical care, and post-injury evolution of needs also contribute to variability of deficits within the TBI population.

Not only do a broad range of consequences exist, but research suggests 45% of individuals with moderate to severe TBI demonstrate a lack of awareness of their deficits (Flashman & McAllister, 2002). A report by Flashman and McAllister (2002), stated that victims of TBI significantly under-report their behavioral and cognitive symptoms. The authors report that a lack of awareness can impact treatment because individuals are not aware of their cognitive, behavioral, and psychosocial limitations. Reduced awareness of limitations can result in a wide range of difficulties including: (a) decreased motivation to address problem areas they do not recognize as problematic, (b) pursuing unrealistic goals, and (c) inappropriate placement in rehabilitation programs because of incorrect assessment. A similar report found that individuals with moderate to severe TBI can overestimate their functioning as late as one year post injury (Dirette & Plaisier, 2007). Children with TBI also exhibit a performance monitoring deficit which is shown as a failure to slow after erroneous inhibition responses (Ornstein et al., 2009). Ornstein and colleagues (2009) suggest that a deficit in performance monitoring could result in
inconsistent or poorly regulated behavior, deficits in self-regulated learning, and a lack of awareness of performance.

If students with TBI lack awareness of their deficits, and educators and administrators lack knowledge about students with TBI in their schools, then it would be likely that these students’ needs would go unaddressed. Hence, becoming familiar with the academic and behavioral consequences of TBI is essential for educators to recognize deficits in students who may be unaware of their own limitations.

**Academic consequences.** Several reports have presented information on the academic consequences associated with TBI (Arroyos-Jurado et al., 2000; Clark, 1996; Clark, Russman, & Orme, 1999; D’Amato & Rothlisberg, 1996, Mohr & Bullock, 2005). These studies report students with TBI can present with negative academic outcomes in three main areas of difficulties: language, cognition, and achievement. The varied educational implications of TBI indicate no two students will present with the exact same deficits but existing commonalities can be used by educators to identify students who are displaying adverse academic outcomes (Ylvisaker et al.,2001).

**Language.** Clark et al. (1999) state deficits in motor functioning affecting speech are among the most common outcomes of TBIs. Although speech deficits may recover quickly, problems with receptive language can persist and interfere with learning (Clark, 1996). In addition, language problems including production, pragmatics, word finding, fluency, and comprehension may be more difficult to detect and may recover at a slower rate (Angeleri, Bosco, Zettin, Sacco, Colle, & Bara, 2008; Clark, 1996; D’Amato & Rothlisberg, 1996). Angeleri and colleagues (2008) suggests individuals with TBI have increased difficulties interpreting and producing paralinguistic aspects of speech. They
may focus entirely on the content of speech rather than the emotional context behind it. Recent research has found deficits in language organization and content of speech as well as impairments in language formulation as demonstrated by the use of fewer words and less complex sentence structure (Coelho, 2007; Slomine & Locascio, 2009).

**Cognition.** Children with more moderate to severe injuries are likely to suffer from additional cognitive deficits including problems with attention, memory, problem solving, organizing, and generalizing information (Catroppa, Anderson, Morse, Haritou, & Rosenfeld, 2007; Clark, 1996; D’Amato & Rothlisberg, 1996; Mohr & Bullock, 2005). Attention difficulties are a main cognitive deficit that can appear immediately following a TBI (Kwok, Lee, Leung, & Poon, 2008). According to Kwok and colleagues, individuals with mild TBI may see quicker improvements in information processing and divided attention; however, deficits in sustained attention can remain present as long as three months post injury. Research also suggests that cognitive skills still in development at the time of injury may develop slower post-injury (Catroppa et al., 2007).

**Academic achievement.** Lastly, students with moderate to severe TBI may also face problems with academic achievement (Ewing-Cobbs, Barnes, Fletcher, Levin, Swank, & Song, 2004). It is important to recognize problems with academic achievement may not be apparent immediately after the injury. In fact, such deficits may not appear until a year or more after the injury which increases the likelihood the deficits will not be attributed to the injury (Clark, 1996, Clark et al., 1999; Fay, Yeates, Wade, Drotar, Stancin, & Taylor, 2009). In addition, Fay and colleagues (2009) found that lower premorbid school competence was associated with continual deterioration in adaptive and academic functioning. This suggests that children who have a history of
deficits in academic achievement are at greater risk for more persistent deficits post-injury. Further, a study by Arroyos-Jurado et al. (2000) found academic achievement in reading and spelling post-injury was significantly impacted by premorbid problems – the lower a child’s ability before the injury, the more likely he is to experience post-injury problems. Implications of these studies indicate more intense services may be necessary for the child with TBI who also had premorbid difficulties.

**Behavioral consequences.** TBI can result in changes in behavior and personality as well as negative social and emotional outcomes (Chapman, Wade, Walz, Taylor, Stancin, & Yeates, 2010; Ganesalingam, Sanson, Anderson, & Yeates, 2006; Hawley, 2004; Max et al., 2006; Mohr & Bullock, 2005; Yeates et al., 2004). Children with TBI are three times more likely than the general population to develop some sort of behavior disorder (Clark, 1996) and psychosocial effects are one of the most challenging symptoms for educators to manage (Mohr & Bullock, 2005). Behavior can be influenced by many different factors, including classroom environment and more demanding schedules (Hawley, 2005). An understanding of behavioral and social/emotional consequences of TBI is important for recognizing connections between a child’s brain injury and any subsequent shifts in behavioral functioning.

**Behavior/Personality.** Impulsivity, hyperactivity, disinhibition, aggression, and decreased tolerance for stress or frustration are among the most common behavior and personality changes (Clark, 1996; Clark et al., 1999, D’Amato & Rothlisberg, 1996). Behavioral problems often continue to be reported several years post-injury, suggesting this is a deficit that requires continued attention. No level of trauma is exempt from behavior or personality changes; mild, moderate and severe injuries are all characterized
by negative behavioral outcomes (Hawley, 2004). However, severity of injury can predict personality changes, with more severe injuries predicting more long-term personality change (Max et al., 2006). In addition, common behavioral problems such as hyperactivity and aggression are among the most common reasons children with TBI are referred to special education (Clark, 1996).

**Social/Emotional.** Common social and emotional problems include emotional unpredictability and lability, depression, anxiety, social withdrawal and isolation, poor problem solving skills, and mood swings (Chapman et al., 2010; Clark, 1996; Clark et al., 1999; D’Amato & Rothlisbeth, 1996; Mohr & Bullock, 2005). Shifts in emotional stability can affect peer interactions, making it difficult for students with TBI to maintain positive relationships (Mohr & Bullock, 2005); severe TBI can result in deficits in social competency, which can also affect peer relationships (Chapman et al., 2010). Problems with externalizing behaviors such as anger, defiance, and destructiveness can result in children being socially ignored and isolated, which lead to further deficits in problem solving abilities and self-control (Chapman et al., 2010; Ganesalingam et al., 2006). A study by Yeates and colleagues (2004) examined the long term social outcomes of pediatric TBI. They found TBI results in negative social outcomes that can be worsened by family environments with fewer family resources and poor family functioning. Implications of this study indicate interventions for improving social and behavioral functioning may need to include family components and take into account injury severity.

An awareness of the academic and behavioral consequences of TBI allows educators to recognize them in the school setting. Furthermore, a greater understanding of the outcomes could provide better knowledge of the interventions and
accommodations students with TBI require. Once educators have recognized the student with TBI in their classroom, they must then know how to provide them with proper placement and intervention within the school system.

**Educational Planning**

When deciding educational planning for students with TBI, transitions, classification, and educational supports/interventions are main areas of concern (Savage, 1991; Ylvisaker et al., 2001). A study by Taylor and colleagues (2003) found results consistent with the hypothesis that children with TBI will require long-term interventions. They found a substantial portion of their TBI participants remained in special education programs several years post-injury. Many of those placements were made relatively soon after the injury – this indicates initial placements can be long-lasting and thus should not be made lightly. In addition, the study found predictors of long-term special education placement included more severe TBI, greater socioeconomic disadvantage, more pre-injury problems in behavior and academic performance, and greater weaknesses on cognitive and academic achievement tests. Implications of this study indicate children with TBI who will require long-term assistance can be identified by these predictors and should be given help immediately upon returning to school.

It is interesting to note they also found less than half of their severe TBI participants were classified under the TBI category. Some students were misclassified under other categories such as specific learning disability. The authors suggest numerous reasons for the underutilization of the TBI category, including the lack of knowledge for developing programs specific to children with TBI. Regardless of reasons for misclassification, they suggest inappropriate classification can result in ineffective
programming and interventions that are limited in scope. This finding serves to emphasize the importance of proper classification and interventions for students with TBI. Becoming familiar with knowledge and resources available to these students will help educators make successful placement decisions. Placement decisions can be made more effectively by beginning with thorough and organized transitions back to school, followed by correct identification and classification, and ending with providing the proper educational programming and supports based on the student’s needs.

**Transitions.** According to Ylvisaker et al. (2001), hospital-to-school transition procedures should include communication and training with school staff, updates and orientation to school peers, plans for adequate educational and social supports, frequent progress monitoring, and effective case management. In addition, decisions about educational placement should be made only after a multifaceted evaluation of the students’ needs have been done. Ylvisaker and colleagues state one crucial way to provide transition support to the child with TBI is to make sure case management is accessible to the child throughout their educational career. Hospital-to-school transition support is a predictor of receiving special education services (Glang et al., 2008). Glang and colleagues suggest their findings indicate that not being informed of a child’s TBI results in that child being less likely to receive services. This study indicates how effective transitions may also support correct identification and classification once the child is back in school.

**Classification.** With the reauthorization and renaming of the Education for Handicapped Children’s Act to the Individuals with Disabilities Education Act (PL 101-
476) in 1990, TBI was added and defined as a disability category. The current federal definition is as follows:

Traumatic brain injury (TBI) is an acquired injury to the brain caused by an external physical force, resulting in total or partial functional disability or psychosocial impairment or both. The term applies to open or closed head injuries resulting in the impairment of one or more areas such as: cognition, language, memory, attention, reasoning, abstract thinking, judgment, problem solving; sensory, perceptual and motor abilities; psychosocial behavior, physical functions; information processing, and speech.

Identifying students with TBI can still be complicated, especially since mild brain injuries can often go unreported or be treated in non-hospital medical settings (National Center for Injury Prevention and Control, 2003). Again, despite the option of a TBI category, students with TBI have often been classified under different disability categories (Taylor et al., 2003). Glang and colleagues (2008) found that speech and language concerns as well as social and behavioral concerns are significantly correlated with receiving special education services. Such findings suggest that students with TBI who exhibit more prominent concerns may be more likely to receive educator attention and, subsequently, proper classification.

Proper assessment can help individualize a reentry plan and allow for better monitoring of changes in functioning (Deidrick & Farmer, 2005). Functional domains that require assessment include: (a) processing speed and style; (b) cognitive skills; (c) language; (d) academic achievement; (e) emotions; (f) behavior; and (g) physical concerns (Keyser-Marcus, Briel, Sherron-Targett, Yasuda, Johnson, & Wehman, 2002). Assessment should focus on preinjury and postinjury functioning in order to determine all possible areas of vulnerability (Deidrick & Farmer, 2005). Thorough assessment
techniques are multi-faceted, encourage proper classification, and ensure educational programming that fits the child’s needs.

**Educational Supports/Interventions.** When a child with a TBI returns to the school setting the use of a response-to-intervention strategy can assess the effects of treatment and be used to make decisions about adjusting interventions (Dykeman, 2009). Yvisaker (2005) reported the key features of effective academic interventions include context sensitivity and instruction that is long-term, intensive, and personally meaningful to the student. Furthermore, combining student needs with well-known teaching strategies can serve as interventions that aid teachers with educational planning (Ylvisaker, 2001). Such teaching strategies include appropriate pacing, task analysis and organizational support, sufficient practice and review, and facilitation of generalization. D’Amato and Rothlisberg (1996) suggest modifications be made in terms of three broad categories of intervention – structure, organization, and strategy. Bowen (2005) also emphasizes the importance to environmental structure and specialized teaching strategies. These include simplifying the classroom environment; establishing predictable, consistent routines; and utilizing effective teaching strategies such as direct instruction, precision commands, errorless learning, and self-management. These learning strategies can help students problem solve and learn more efficiently. Focusing on methods and processes can help students develop learning strategies that will be useful to them throughout their educational career.

Behavior and social interventions should also be included when considering necessary supports. Behavior interventions should be preceded by a functional behavior assessment which can quantify frequency, duration, and intensity of behaviors as well as
determine antecedent and consequence events (Dykeman, 2009). Clark et al. (1999) described several behavioral interventions including using concrete and social reinforcers for compliance, preplanned consequences, teacher praise, and overcorrection. Behavioral interventions should consist of an approach that is executive-system orientated, positive, proactive, and family-centered (Ylvisaker, 2005). In a review of studies examining behavioral interventions, Gurdin, Huber and Cochran (2005) found the most effective behavioral interventions in schools were ones with multiple components.

Social skills training is a common intervention to address social problems (Bowen, 2005; Clark et al., 1999; D’Amato & Rothlisberg, 1996; Ylvisaker, 2005). Concrete lessons in social behavior can be tailored to an individual student’s needs through observations conducted by school staff (D’Amato & Rothlisberg, 1996). Bowen (2005) reports social skills training should focus on teaching specific skills such as turn taking, active listening and initiating and maintaining conversations. In addition, students should be given multiple opportunities for practice followed by constructive feedback. Because social deficits following TBI are often based on self-regulatory impairment instead of a gap in social knowledge, social skills training is vital because it requires contextualized interventions and supports (Ylvisaker, 2005).

Knowledge of educational programming and supports is essential to an educator’s ability to provide those supports in the school settings. However, little is known about the current state of educator knowledge regarding proper accommodations for students with TBI. What is known about educator knowledge suggests many wish they had a better understanding of TBI and many feel there is a lack of knowledge regarding the education needs of students with TBI (Janus, 1994; Mohr & Bullock, 2005).
understanding of current educator knowledge and how that knowledge is provided (e.g.,
teacher training programs) will provide a base for determining the gaps in knowledge and
allow for comparisons between knowledge levels and training opportunities.

**Educator Knowledge and Training Regarding TBI**

It has been stated that in order to facilitate long-term planning and treatment, it is
necessary for educators to know exactly what TBI is as well as how it differs from other
conditions (Shaughnessy et al., 2006). However, many school systems lack professionals
who understand the causes and consequences of TBI (Funk et al., 1996; Glang, Todis,
Although many schools are equipped to provide supports to students with TBI, additional
staff training is necessary in order for these resources to be used effectively (Glang et al.,
2010; Janus, 1994). Special education teachers have reported their job is made
overwhelming when they are assigned large numbers of students along with an extended
case load of students whose primary placement is in the general education setting
(Coleman, 2001). General education teachers report increasing numbers of students with
exceptionalities, yet they report feeling unprepared to meet their needs (Coleman, 2001).
Not only do teachers feel unprepared, but little is being done in terms of personnel
preparation to address these shortcomings (Coleman, 2001). Lack of educator knowledge
along with misconceptions and inadequate training can have dramatic consequences on
the support provided for students with TBI.

**Educator knowledge.** Past research has revealed educator knowledge about TBI
to be not only lacking, but also plagued by misconceptions. A study by Funk, Bryde,
Doelling, and Hough (1996) found respondents lacked understanding of the definition
and criteria for TBI with over two-thirds indicating they were “not knowledgeable.” There was, however, a greater understanding of the areas of difficulty experienced by individuals with TBI. Respondents noted they were aware of difficulty in the areas of social/emotional/behavioral, academic/vocational, cognitive/adaptive behavior, speech/language, and health/motor. Another study by Farmer and Johnson-Gerard (1997) found educators were more likely to display misconceptions about TBI when compared to rehabilitation staff but held fewer misconceptions than the general public. This indicates educators may be better informed due to general training, but specific information regarding TBI clearly needs to be provided.

A more recent study by Mohr and Bullock (2005) used focus groups to ascertain educators’ level of preparedness and awareness of TBI. Only half of the participants responded they received formal training concerning TBI. Formal training was defined as in-service sessions or as part of a college course. None of the participants reported training was received in undergraduate study. Interestingly, 71% indicated college coursework devoted to brain injury was very important. The majority of participants also indicated information regarding TBI was given on a need-to-know basis and was not addressed with wide-scale training.

Lack of educator knowledge regarding TBI is a troubling situation that needs to be addressed in order to strengthen student supports. Evaluating ways to train educators could identify which ones are successful and may provide key characteristics of training essentials. Some state departments of education have produced TBI manuals and offered training sessions to increase the understanding of this population (Ylvisaker, 2005). In addition, many state education agencies have a TBI contact person providing professional
development in the form of workshops and presentations (Markowitz & Linehan, 2001). However, Ylvisaker reported teacher training outside the context of the classroom has little impact on instruction and behavior management. Rather, training and support for educators must come in a form that is applicable to daily classroom experiences. Savage, DePompei, Tyler, and Lash (2005) report the lack of educator knowledge is due in part to an insufficient amount of research on effective programming strategies and instructional practices. They suggest this forces educators to rely on proven interventions for similar types of learning and behavioral problems.

**Educator training.** Strategies for addressing the issue of educator training are numerous. One strategy includes providing training through workshops, professional training and development programs, or published literature (Blosser & DePompei, 1991; Janus, 1996; Shaughnessy et al., 2006). This kind of training is provided to educators already in the field. Bullock, Gable, and Mohr (2005) suggest several important areas of knowledge and skills needed by educators. These areas include: (a) knowledge of the nature and psychosocial implications of TBI, (b) discussions of the similarities and differences between TBI and other disabilities, (c) the impact of TBI on academic and behavioral performance, (d) skill in developing individualized programs based on individual strengths and weaknesses, (e) assessment and teaching strategies, and (f) collaboration with the family and professionals in the rehabilitation setting. These authors also state that knowledge of community services is essential to providing proper assistance to children and their families.

Training in how to work with children with a TBI is rarely included in the curriculum of teacher training programs and the absence of teacher preparation programs
in this area has been identified as one of the major issues in providing services to students with TBI (Janus, 1996). Clearly, another strategy would be to include TBI training at the university level (Janus, 1996; Tyler, 1997; Ylvisaker et al., 2001). Ylvisaker and colleagues (2001) support developing Internet-based courses that can be used in both preservice and continuing education courses. Tyler (1997) suggests three ways training can be incorporated into the preservice education programs: (a) introductory training sessions incorporated into special education classes to provide awareness to both special and general education teachers, (b) a graduate-level course to train special education teachers, and (c) engaging in field-based experiences. Objectives of such courses would range from becoming familiar with definitions of TBI to gaining awareness of recovery patterns and strategies for interventions, and becoming knowledgeable about other agencies that provide services for these students.

One last method of addressing the issue of lack of training is to utilize training models that include training in evidence-based interventions, supervised practice of new skills, mentoring, feedback, and consultation (Glang et al., 2010). Glang and colleagues (2010) suggest that models that focus on these strategies help educators feel more knowledgeable and equipped to work with students with TBI. One model is presented by Glang, Tyler, Pearson, Todis, and Morvant (2004) when they developed a program for providing support to school personnel that includes both information and access to technical assistance. They identified the level of state resources available to educators as inadequate to meet the needs of students with TBI who are returning to school. They developed the TBI Consulting Team model which focuses on transferring skills learned in training to the classroom setting. The goal of the model is to make peer consultants
available to provide in-service training and continuing consultation in order to serve as a prevention method for problems schools may face. The authors explain that such on-site training is necessary for transferring information learned in training into the classroom setting. Success was found when this Team model was implemented in Oregon; some of the advantages of this model include allowing access to resources for school personnel, enhanced networking, increased awareness of TBI, and widespread dissemination of TBI materials.

A second model, Brain Injury: Strategies for Teams and Re-education for Students (BrainSTARS), is presented by Dise-Lewis, Lewis, and Reichardt (2009) which utilizes an individualized consultation program with a comprehensive manual on acquired brain injury (ABI). Following a pilot test of this program, significant improvements were found in participants’ self-rated proficiency in working with children with ABI. The researchers suggested their findings indicated the BrainSTARS program increased the ABI-related competencies of parents and educators.

In order to understand what training is needed, it is essential to know how teacher training programs are preparing future educators. Knowledge of the degree of formal training on TBI provided in training programs will give a better understanding of the level of preparedness educators feel when entering the school system. For the purposes of this study, formal training is defined as a class or seminar that includes the topic of TBI. In addition to studying what formal training is provided, it is also important to study the knowledge of TBI undergraduate teacher candidates and how this knowledge relates to the training they were provided. Studying the connections between preservice training and their knowledge and preparedness levels prior to entering the field will
reveal the possible deficits in current undergraduate training. Knowing the quality and quantity of pre-service training undergraduates are receiving will also provide a background for additional studies on current teacher knowledge and preparedness levels.
Method

Research Question and Hypotheses

The primary research questions in this study include: 1) What kind of training is provided in teacher training programs in regards to TBI?, 2) Is there a difference between TBI training provided in Special Education programs versus the TBI training provided in Regular Education programs?, 3) How does training impact undergraduate teacher candidates’ level of knowledge regarding TBI? The associated null hypotheses are as follows:

Null Hypothesis #1. There will be no differences in the extent of coverage of TBI training.

Null Hypothesis #2. For Education programs that include formal TBI training, Special Education programs will not include more TBI specific training than Regular Education programs. Programs that include formal TBI training will include this training equally in their Special Education track and Regular Education track.

Null Hypothesis #3. Undergraduate teacher candidates who receive formal training in TBI are equally as knowledgeable about TBI as undergraduate teacher candidates who do not receive formal training.

Participants

Two online surveys were distributed to Education department faculty members from colleges across the United States. The survey of university curriculum was distributed to a total of 2017 Education department faculty members. A total of 186
faculty members participated in the study. After reviewing the data and removing participants whose data was missing or incomplete, there was a total of 156 sets of complete participant data, yielding a usable response rate of 7.73%. Descriptive statistics were conducted on the complete sets of data (See Table 1).

Table 1. Survey of University Curriculum Descriptive Statistics

<table>
<thead>
<tr>
<th>Position</th>
<th>N</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chair/Director</td>
<td>12</td>
<td>7.7%</td>
</tr>
<tr>
<td>Professor</td>
<td>120</td>
<td>76.9%</td>
</tr>
<tr>
<td>Other</td>
<td>24</td>
<td>15.4%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>University Type</th>
<th>N</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private</td>
<td>7</td>
<td>4.5%</td>
</tr>
<tr>
<td>Public</td>
<td>149</td>
<td>95.5%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Region</th>
<th>N</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northeast</td>
<td>34</td>
<td>21.8%</td>
</tr>
<tr>
<td>Southeast</td>
<td>31</td>
<td>19.9%</td>
</tr>
<tr>
<td>Midwest</td>
<td>39</td>
<td>25%</td>
</tr>
<tr>
<td>Southwest</td>
<td>42</td>
<td>26.9%</td>
</tr>
<tr>
<td>Northwest</td>
<td>10</td>
<td>6.4%</td>
</tr>
</tbody>
</table>

The teacher candidate knowledge questionnaire was distributed to 1039 Education department faculty members with a request to forward it to students majoring in Education. A total of 208 undergraduate students participated in the study. After reviewing the data and removing participants whose data was missing or incomplete, there were 144 sets of complete participant data. Because it is not known how many students received the survey, a response rate cannot be determined. Descriptive statistics were also conducted on the complete sets of student data (See Table 2).
Table 2. Teacher Candidate Knowledge Questionnaire Descriptive Statistics

<table>
<thead>
<tr>
<th>Year of Graduation</th>
<th>N</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>2011</td>
<td>40</td>
<td>27.8%</td>
</tr>
<tr>
<td>2012</td>
<td>57</td>
<td>39.6%</td>
</tr>
<tr>
<td>2013</td>
<td>27</td>
<td>18.8%</td>
</tr>
<tr>
<td>2014</td>
<td>20</td>
<td>13.9%</td>
</tr>
</tbody>
</table>

Procedure

A random sampling technique was used to gather data from participants. The National Council for Accreditation of Teacher Education (NCATE) website was used to find colleges with Education departments. The country was divided into 5 regions (Northeast, Southeast, Midwest, Southwest, and Northwest) and an equal number of schools from each region were used. Schools were chosen based on size (number of students attending) and whether they were public or private. From each region, 20 schools were chosen: 15 public and 5 private. Of the 15 public schools, 5 were “small” (less than 10,000 students), 5 were “medium” (10,000-20,000 students) and 5 were “large” (over 20,000 students). Education department faculty names and e-mail addresses were obtained from faculty databases on each school’s website. E-mail addresses were then uploaded onto the online survey website, surveymonkey.com.

The survey was created using surveymonkey.com, an online survey distributor. Faculty members and undergraduate students were informed of the nature of the study and asked to voluntarily participate. Security features on the website ensured participants’ data would be securely transmitted and would remain confidential.

Surveys were distributed to Education department faculty members via e-mail. Student surveys were distributed by asking Education department faculty to forward a
survey link to undergraduate Education majors. Each e-mail described the purpose of the study and solicited participation of faculty members and students. Faculty members and students were also informed of the period of time for which the survey would be open. Reminder e-mails were sent every two weeks following the initial e-mail to encourage the participation of those who had not yet responded. Education department faculty members were not offered an incentive for completing the survey. Undergraduate students were offered an incentive in the form of a raffle for a $50 Visa gift card. Undergraduate students could gain entry into the raffle upon completion of the teacher candidate knowledge questionnaire.

Instruments

Survey of university curriculum. A survey of university curriculum was used to answer the first and second research questions. Demographic data were gathered and included: participants’ position within the department, whether their university was public or private, the approximate number of students that attend their institution, the region of the country in which their institution is located, and program specialty they affiliated with. Participants were then asked whether they taught a class that contained information on TBI. If participants answered “No” they were finished taking the survey. If participants answered “Yes” they responded to additional questions regarding that class. Additional questions included: course category, whether the course was required or not, extent of coverage, number of minutes devoted to discussion of TBI, if another faculty member taught the same class, and whether the class was undergraduate or graduate level. Faculty members were also asked to list texts and resources used in that
class. Before it was administered, the survey was piloted at the University of Dayton and the University of Western Oregon.

**Teacher Candidate Knowledge Questionnaire.** A teacher candidate knowledge questionnaire was used to answer the third research question. The questionnaire for the current study was adapted from four existing questionnaires (Farmer, 1997; Gouvier et al., 1988; Hux, Walker, and Sanger, 1996; O’Jile et al., 1997). Data on reliability and validity information for these instruments is limited. A paper-and-pencil pilot test using the adapted questionnaire was conducted at the University of Dayton, Nicholls State University, and Western Oregon University before it was administered to undergraduate teacher candidates. The purpose of the pilot test was to refine the teacher candidate knowledge questionnaire to a total of 30 questions. The questionnaire response format is a 4-point true-false scale (false, probably false, probably true, and true). Students were also asked demographic information including: their current program, intended year of graduation, whether their program offered training in TBI, how much class time was devoted to discussion of TBI, and what texts and resources were used in the course. Student participants indicated whether they had completed or were in the process of completing their student internship. If they answered “Yes” to that question, students were asked if they had worked with a student with a TBI in the school setting. Students were also asked about personal experiences related to TBI; whether they or a family member have ever had a concussion or moderate to serious brain injury.
Results

Data Analysis

Data were collected during the winter of 2010-2011. Demographic data were collected through the use of yes/no and free response questions. Thus, demographic data were primarily nominal in nature. Undergraduate teacher candidate knowledge of TBI was evaluated by responses to Likert-format questions and therefore could be considered ordinal or interval. For each student response, an overall knowledge score was determined by converting the ordinal/interval data into scaled data. Scores were converted by giving correct answers (answering either True or False correctly) 2 points and partially correct answers (for example, answering a true question as Probably True) 1 point. Incorrect answers were given 0 points. Total knowledge scores could range from 0 to 60 points. Nonparametric statistics were used to analyze nominal data and respond to the first two hypotheses. Parametric statistics in the form of an independent samples t-test were used to answer the third hypothesis. In order to determine significance, the p value was set at .05.

TBI Training in Undergraduate Programs

Null Hypothesis 1 stated there will be no differences in the extent of coverage of TBI training. This null hypothesis was tested by conducting a series of one-sample chi-square test to determine the extent of TBI specific training reported by individual faculty members. The variable being analyzed was “Does your course cover TBI?” This variable had two levels: yes, their course does cover TBI; and no, their course does not
cover TBI. Whether or not TBI-specific training was covered within a single course given by an individual Education department faculty member was statistically significant, \( \chi^2 (1, N = 156) = 17.33, p = .00 \). The majority of Education department faculty members who responded to the survey (66.7%) reported they did not provide TBI-specific training within any of the courses they taught (See Table 3). Next, the courses of faculty who indicated they included TBI within their courses were analyzed to determine if there was a difference in extent of coverage. The variable being analyzed was “extent of coverage.” This variable had two levels as well: within one class, or over 1-2 classes.

The length of time spent covering TBI was statistically significant, \( \chi^2 (1, N = 55) = 4.09, p = .04 \). The majority of courses that included TBI did so during one class (63.6%) versus more than one class (36.4%) (See Table 4).

Table 3. TBI-Specific Training in the Undergraduate Curriculum

<table>
<thead>
<tr>
<th>Does your course cover TBI?</th>
<th>Observed N</th>
<th>Expected N</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>52</td>
<td>78</td>
<td>33.3%</td>
</tr>
<tr>
<td>No</td>
<td>104</td>
<td>78</td>
<td>66.7%</td>
</tr>
</tbody>
</table>

Table 4. Extent of TBI Coverage Within Courses that Include TBI

<table>
<thead>
<tr>
<th>Extent of TBI Coverage</th>
<th>Observed N</th>
<th>Expected N</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within one class</td>
<td>35</td>
<td>27.5</td>
<td>63.6%</td>
</tr>
<tr>
<td>Over 1-2 classes</td>
<td>20</td>
<td>27.5</td>
<td>36.4%</td>
</tr>
</tbody>
</table>

Null Hypothesis 2 stated that for Education programs that include formal TBI training, Special Education programs will not include more TBI specific training than Regular Education programs. Programs that include formal TBI training will include this training equally in their Special Education track and Regular Education track. This null
hypothesis was tested by conducting a two-way contingency table analysis using crosstabs to determine if more faculty members in the General Education or Special Education program included TBI specific training within the courses they taught. The first variable, program affiliation, had two levels: General Education and Special Education. The second variable, TBI coverage, had two levels as well: “yes”, TBI was discussed in their class, or “no”, TBI was not discussed in their class. It was found that there was a statistically significant difference between the TBI coverage provided by faculty members affiliated with the General Education program versus the TBI coverage provided by faculty members affiliated with the Special Education program, $\chi^2 (1, N = 156) = 71.32, p = .00$. A greater percentage of Special Education faculty members (72.6%) provided TBI specific training within the courses they taught (See Table 5). A lesser percentage of General Education faculty members (7.4%) provided TBI specific training within the courses they taught.

Table 5. TBI Training by Program Affiliation

<table>
<thead>
<tr>
<th>Program Affiliation</th>
<th>General Education</th>
<th>Special Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>N = 7</td>
<td>N = 45</td>
</tr>
<tr>
<td></td>
<td>7.4%</td>
<td>72.6%</td>
</tr>
<tr>
<td>Teach TBI</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td></td>
<td>N = 87</td>
<td>N = 17</td>
</tr>
<tr>
<td></td>
<td>83.7%</td>
<td>16.3%</td>
</tr>
</tbody>
</table>

Undergraduate Knowledge of TBI

Overall, knowledge scores ranged from 11 to 45, with a mean score of 25.73 and a standard deviation of 6.54. The highest possible score was 60 and the lowest possible score was 0. Analyses of the data were conducted to test Hypothesis 3, and additional
analyses were conducted to further examine the difference in knowledge of TBI with regard to program affiliation.

Null Hypothesis 3 stated that undergraduate teacher candidates who receive formal training in TBI will not be more knowledgeable about TBI than undergraduate teacher candidates who do not receive formal training. This null hypothesis was tested using an independent samples t-test with TBI training as the independent variable (either “yes”, they had TBI specific training, or “no”, they did not have TBI specific training) and knowledge of TBI as the dependent variable. Students who reported having TBI training had statistically significantly different amounts of knowledge of TBI as compared to students who reported having no TBI specific training, \( t(142) = 3.04, p = .003 \). Students who reported having TBI specific training (\( M = 28.33, \text{SD} = 5.77 \)) had more knowledge of TBI than those students who reported having no TBI specific training (\( M = 24.73, \text{SD} = 6.58 \)) (See Table 6).

Table 6. Program Training and Knowledge Scores

<table>
<thead>
<tr>
<th>Does your program offer training in TBI?</th>
<th>N</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>40</td>
<td>28.33</td>
<td>5.77</td>
</tr>
<tr>
<td>No</td>
<td>104</td>
<td>24.73</td>
<td>6.58</td>
</tr>
</tbody>
</table>

Formal training on TBI was defined as a class or seminar that discussed TBI. Within the survey students could identify whether their formal training was part of a class/seminar or a survey class on disabilities. They could also mark “other” if their training did not fit into either category. Of the students who reported having formal training, a greater percentage had that training within a survey class on disabilities (73.9%) versus a class/seminar (23.9%). One participant marked the “other” category
and noted they had had formal training during medical training. Open-ended questions asked how much class time was devoted to TBI training. In order to analyze these open-ended responses, they were categorized into six groups: minutes, hours, one class, more than one class, weeks, or alternate method. The term “alternate method” refers to those respondents who stated they had a group project or paper assignment on the topic of TBI.

A total of 50 participants responded to this question, including participants who had indicated their program did not cover TBI. Individual responses ranged from “a few minutes” to “about 2 or 3 weeks.” However, once responses were categorized, the majority of students (40%) stated that one to several hours was devoted to TBI training. (See Table 7).

Table 7. Extent of TBI Coverage

<table>
<thead>
<tr>
<th>TBI Coverage</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minutes</td>
<td>12</td>
<td>24%</td>
</tr>
<tr>
<td>Hours</td>
<td>20</td>
<td>40%</td>
</tr>
<tr>
<td>One Class</td>
<td>5</td>
<td>10%</td>
</tr>
<tr>
<td>2+ Classes</td>
<td>5</td>
<td>10%</td>
</tr>
<tr>
<td>Weeks</td>
<td>4</td>
<td>8%</td>
</tr>
<tr>
<td>Alternate Method</td>
<td>4</td>
<td>8%</td>
</tr>
</tbody>
</table>

The difference in knowledge of TBI with regard to program affiliation was also examined. A two-way contingency table analysis using crosstabs was conducted to determine if students who affiliated with the General Education program or students who affiliated with the Special Education program reported having more TBI specific training. The first variable, program affiliation, had two levels: General Education and Special Education. The second variable, TBI specific training, had two levels as well: “yes” they had TBI specific training, or “no” they did not have TBI specific training. There was a
statistically significant difference between the TBI specific training received by the students affiliated with the General Education program versus the TBI specific training received by the students affiliated with the Special Education program, $\chi^2(1, N = 144) = 35.18, p = .00$. A greater percentage of students who affiliated with Special Education (64.1%) reported having TBI specific training (See Table 8). A lesser percentage of students affiliated with General Education (14.3%) reported having TBI specific training.

Table 8. TBI Training by Student Program Affiliation

<table>
<thead>
<tr>
<th>Program Affiliation</th>
<th>TBI Training</th>
<th>General Education</th>
<th>Special Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>N = 15</td>
<td>14.3%</td>
<td>N = 25</td>
</tr>
<tr>
<td>No</td>
<td>N = 90</td>
<td>85.7%</td>
<td>N = 14</td>
</tr>
</tbody>
</table>

As a follow-up, another independent samples t-test was conducted with program affiliation as the independent variable (either General Education or Special Education) and knowledge of TBI as the dependent variable. Students who affiliated with the different programs had statistically significant different amounts of knowledge of TBI, $t(142) = -4.26, p = .00$. Students who reported affiliating with the General Education program ($M = 24.39, SD = 6.13$) had significantly less knowledge of TBI than those students who reported affiliating with the Special Education program ($M = 29.33, SD = 6.34$) (See Table 9).
Null Hypothesis 3 was also analyzed using only data from upperclassmen in order to confirm significance of results with students more likely to have taken classes where information on TBI would be presented. After removing data from undergraduates graduating after 2012, 96 complete sets of data were analyzed. For this study, upperclassmen were defined as any undergraduate student graduated on or before 2012.

Overall, knowledge scores ranged from 14 to 45, with a mean score of 26.26 and a standard deviation of 6.21. The highest possible score was 60 and the lowest possible score was 0. Analyses of the data were conducted to test Hypothesis 3, and additional analyses were conducted to further examine the difference in knowledge of TBI with regard to program affiliation.

It was found that upperclassmen who reported having TBI training had statistically significantly different amounts of knowledge of TBI as compared to upperclassmen who reported having no TBI specific training, \( t(94) = 2.28, p = .025 \). Upperclassmen who reported having TBI specific training (\( M = 28.08, SD = 5.43 \)) had more knowledge of TBI than those upperclassmen who reported having no TBI specific training (\( M = 25.17, SD = 6.43 \)) (See Table 10).
Table 10. Program Training and Upperclassmen Knowledge Scores

<table>
<thead>
<tr>
<th>Does your program offer training in TBI?</th>
<th>N</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>36</td>
<td>28.08</td>
<td>5.43</td>
</tr>
<tr>
<td>No</td>
<td>60</td>
<td>25.17</td>
<td>6.43</td>
</tr>
</tbody>
</table>

Of the upperclassmen who reported having formal training, a greater percentage had that training within a survey class on disabilities (76.5%) versus a class/seminar (20.6%). Open-ended questions asked how much class time was devoted to TBI training. A total of 44 upperclassmen participants responded to this question, including upperclassmen participants who had indicated their program did not cover TBI. Individual responses ranged from “a few minutes” to “about 2 or 3 weeks.” However, once responses were categorized, the majority of students (43%) stated that one to several hours was devoted to TBI training. (See Table 11).

Table 11. Extent of TBI Coverage: Upperclassmen

<table>
<thead>
<tr>
<th>TBI Coverage</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minutes</td>
<td>10</td>
<td>23%</td>
</tr>
<tr>
<td>Hours</td>
<td>19</td>
<td>43%</td>
</tr>
<tr>
<td>One Class</td>
<td>5</td>
<td>11%</td>
</tr>
<tr>
<td>2+ Classes</td>
<td>2</td>
<td>5%</td>
</tr>
<tr>
<td>Weeks</td>
<td>4</td>
<td>9%</td>
</tr>
<tr>
<td>Alternate Method</td>
<td>4</td>
<td>9%</td>
</tr>
</tbody>
</table>

The difference in knowledge of TBI with regard to program affiliation was also examined with upperclassmen. A two-way contingency table analysis using crosstabs was conducted to determine if upperclassmen who affiliated with the General Education program or upperclassmen who affiliated with the Special Education program reported
having more TBI specific training. The first variable, program affiliation, had two levels: General Education and Special Education. The second variable, TBI specific training, had two levels as well: “yes” they had TBI specific training, or “no” they did not have TBI specific training. There was a statistically significant difference between the TBI specific training received by the upperclassmen affiliated with the General Education program versus the TBI specific training received by the upperclassmen affiliated with the Special Education program, $\chi^2 (1, N = 96) = 30.99, p = .00$. A greater percentage of upperclassmen who affiliated with Special Education (79.3%) reported having TBI specific training (See Table 12). A lesser percentage of upperclassmen affiliated with General Education (19.4%) reported having TBI specific training.

Table 12. TBI Training by Upperclassmen Program Affiliation

<table>
<thead>
<tr>
<th>Program Affiliation</th>
<th>General Education</th>
<th>Special Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>N = 13</td>
<td>N = 23</td>
</tr>
<tr>
<td></td>
<td>19.4%</td>
<td>79.3%</td>
</tr>
<tr>
<td>No</td>
<td>N = 54</td>
<td>N = 6</td>
</tr>
<tr>
<td></td>
<td>80.6%</td>
<td>20.7%</td>
</tr>
</tbody>
</table>

As a follow-up, another independent samples t-test was conducted with program affiliation as the independent variable (either General Education or Special Education) and knowledge of TBI as the dependent variable. Upperclassmen who affiliated with the different programs had statistically significant different amounts of knowledge of TBI, $t(94) = -3.08, p = .003$. Upperclassmen who reported affiliating with the General Education program ($M = 25.03, SD = 5.84$) had significantly less knowledge of TBI than those upperclassmen who reported affiliating with the Special Education program ($M = 29.10, SD = 6.21$) (See Table 13).
<table>
<thead>
<tr>
<th>Program Affiliation</th>
<th>N</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Education</td>
<td>67</td>
<td>25.03</td>
<td>5.84</td>
</tr>
<tr>
<td>Special Education</td>
<td>29</td>
<td>29.10</td>
<td>6.21</td>
</tr>
</tbody>
</table>
Discussion

Previous research indicated that school systems often lack professionals who understand the causes and consequences of TBI (Farmer & Johnson-Gerard, 1997; Funk, et al., 1996; Janus, 1994; Janus, 1996; Mohr & Bullock, 2005; Tyler, 1997) and educators lack knowledge of the definition and criteria for TBI (Funk et al., 1996). Previous studies also indicated that training in how to work with children with TBI was rarely included in the curriculum of teacher training programs (Janus, 1996; Mohr and Bullock, 2005). A combined lack of training programs and knowledge indicates educators are entering the field without being fully prepared to address the needs of all students. This study was designed expand upon and update extant research by investigating the curriculum of current teacher training programs and correlating TBI-specific training with levels of knowledge in undergraduate teacher candidates.

Summary of Findings

TBI-specific training was minimal in undergraduate programs. These results were consistent with the findings of Janus (1996) and Ylvisaker (2005), which found TBI was rarely included in the curriculum of teacher training programs, and the absence of teacher preparation programs in this area has been identified as one of the major issues in providing services to students with TBI. In the present study, Education department faculty members reported their program affiliation and whether or not TBI specific training was included in the courses they taught. The majority of faculty respondents stated they did not include TBI-specific training within the courses they taught. These
findings suggest that undergraduate education students are not being provided with sufficient training in TBI.

Faculty who affiliated with Special Education programs were more likely to include TBI-specific training within the courses they teach than faculty who affiliate with General Education programs. These results suggest that TBI-specific training, when given, is not received by a majority of Education students, but rather by just those students who are within the Special Education programs. The U.S. Department of Education reported that, in the 2008-2009 school year, TBI accounted for only .4% of students with disabilities served in the school system, which does not seem compatible with the fact that nearly half a million TBIs occur yearly in children ages 0 to 14 (CDC, 2010; Langlois et al., 2006). These statistics seem to indicate that the majority of children with TBI are being served in the general education curriculum. However, as the present study demonstrates, faculty members who affiliate with General Education programs are less likely to provide TBI specific training to teacher candidates in the courses they teach.

Undergraduate teacher candidates who receive formal training in TBI were more knowledgeable about TBI than undergraduate teacher candidates who do not receive formal training. These results extend previous research, which demonstrated a lack of knowledge of TBI (Farmer & Johnson-Gerard, 1997; Funk, et al., 1996; Janus, 1994; Janus, 1996; Mohr & Bullock, 2005; Tyler, 1997). The present study suggests that teacher candidates who receive formal training on TBI are more knowledgeable regarding the educational impact of a TBI than teacher candidates who do not receive formal training. The majority of formal training was received through a survey class on
disabilities which can range in the extent of time spent discussing different disabilities, such as TBI. These findings indicate the importance of including training on TBI within the teacher training programs, however many students reported that TBI-specific training was brief. Furthermore, the present study found that teacher candidates who affiliated with the Special Education program were more likely to have had formal training on TBI and were more knowledgeable about TBI compared to teacher candidates who affiliated with the General Education program. This suggests that TBI-specific training is not being targeted for all Education students.

The results indicate that TBI-specific training within the undergraduate curriculum is inconsistent and not widely available to all undergraduate Education students. Even when TBI-specific training is in the curriculum, it may not be accessible to all students. In addition, faculty members and administrative officials within Education departments may be unaware of the lack of TBI-specific training within their program. They may assume TBI is covered in introductory classes on disabilities, but they may be unaware of the extent or method of coverage.

This study also indicated faculty members affiliated with Special Education are more likely to include TBI within their classes. Education departments may feel that Special Education courses are the most appropriate courses to contain information on TBI. However, under-identification of TBI suggests students with TBIs are more likely to be in a general education curriculum. If the TBI-specific training is being primarily provided in the Special Education track, as this study indicated, then the necessary training is not being provided to those future teachers, the General Education teachers, who are more likely to interact with students with TBI. General Education teachers
should be provided with as much, if not more, TBI-specific training in order to recognize
indictors and consequences of TBI.

Although Special Education undergraduate teacher candidates had significantly
more knowledge of TBI than General Education undergraduate teacher candidates, the
overall knowledge scores were low. Both Special Education students and General
Education students had knowledge scores of less than 50%. So, even though Special
Education students are receiving more TBI-specific training, and as a result are more
knowledgeable, there are still deficits in their knowledge that need to be addressed. This
indicates the need for a comprehensive, TBI-specific training module that can be
implemented in classes provided to both Special Education and General Education
students.

**Limitations and Future Research**

The use of an online survey as the primary research method can be a limitation.
Limitations to online surveys can include technical difficulties, poor response rates, and
unrepresentative sample (Evans & Mathur, 2005; Granello & Wheaton, 2004). Technical
difficulties can impede survey completion or interfere with submission (Evans & Mathur,
2005). Low response rates for this particular study could be due to the nature of survey
distribution. Distribution to students was reliant upon faculty members forwarding the
survey. In addition, there is the potential of an e-mail survey being deleted by faculty or
students because they are unfamiliar with the sender or have been inundated with
requests to complete various e-mail surveys. A number of other factors including survey
length, ease of return method, and decreased pressure to respond immediately can deter
potential participants. An attempt to combat a low response rate was done by distributing
the survey nation-wide, in a clear and concise online format, with occasional reminders encouraging completion. Also, because surveys use self-report measures, the accuracy of the answers given cannot be guaranteed.

An additional limitation includes the quasi-experimental nature of the study. Education students could not be randomized into “formal training” or “no formal training” groups. They could also not be randomized into “General Education” or “Special Education” tracks. Therefore, it cannot be assumed that the groups of students were equivalent or that there are no confounding variables. Graduating teacher candidates cannot be assigned to “formal training” and “no formal training” groups and this suggests the two groups will not be as random as they would be in a formal experiment.

The instruments used in this study are potential limitations as well. The length and complexity of questions could have deterred potential respondents. In addition, the student survey could have been expanded upon to include more demographic data (location of university, the size of their university, etc.), and more detailed information about extent of TBI coverage. The curriculum survey was designed to measure the scope of TBI training; however, there was not one consistent source within an Education department that could provide information on material covered in all classes within an Education program. Therefore, rather than getting an overview of the extent of TBI training a program as a whole offers, information was gathered on the extent of training provided by individual faculty members. Because of this limitation, the amount of TBI-specific training may be over- or underrepresented. And, while the initial draft of the curriculum survey was pilot tested, the final draft was not, due to time constraints.
Response bias can also be a factor on both the curriculum survey and student survey. Faculty members could have indicated TBI-training in their courses because the nature of the survey indicated the importance of such training. In addition, student answers to knowledge questions could have been influenced by how questions were worded.

Future research can examine the relationship between student knowledge and student skills. Students who are completing their student teaching can be surveyed to see if there is a relationship between student knowledge and the use of different skills based on that knowledge. Students can also be asked about their confidence in using different skills and strategies when working with students with TBI. In addition, it would be beneficial to examine the impact of a TBI training session on student knowledge and skills. Future research can also examine how information about TBI can be presented in order to have the greatest impact on teacher knowledge. For example, additional research can study what course TBI should be covered in, what resources should be used, and the extent of TBI coverage that would be most beneficial. This information can be used to guide teacher training program curriculums.
REFERENCES


APPENDIX A. SURVEY OF UNIVERSITY CURRICULUM

Survey of University Curriculum

Demographic Information

What is your position in the college or Department:

☐ Dean  ☐ Professor
☐ Chair/Director  ☐ Other (please specify)

Which label best describes your university:

☐ Private  ☐ Public

Does your program offer training in traumatic brain injury (TBI)?

☐ Less than 10,000  ☐ 10,000 to 20,000  ☐ More than 20,000

In what region is your institution located:

☐ Northeast  ☐ Southeast  ☐ Midwest  ☐ Southwest  ☐ Northwest

Which general program specialty do you most affiliate with?

☐ Early Childhood Education  ☐ Elementary Education
☐ Middle School Education  ☐ Secondary Education
☐ Special Education

TBI in the Curriculum

Do you teach a course that covers information on Traumatic Brain Injury?

☐ YES  ☐ NO

Consider the course/courses you teach that cover TBI. Please complete all questions of the matrix below for that course. Complete as many rows as necessary if you teach more than one course that covers TBI. Courses at your university may not be titled in the exact same way, but please choose a category that you feel best fits. (This question was represented as a matrix on surveymonkey.com so faculty members could complete the questions for more than one class.)

Course Category:

☐ History and/or Philosophy of Education  ☐ Law/Ethics in Education
☐ Child and/or Adolescent Development  ☐ Educational Psychology
☐ Content Areas and/or Methods  ☐ Literacy/Reading
☐ Special Education and/or Inclusion  ☐ Multicultural Learners
☐ Technology in the Classroom  ☐ Behavior/Classroom Management
Is the course required?
- Yes
- No

Extent of Coverage:
- Within one class (TBI is not the only topic covered)
- Over 1-2 classes (TBI is the only topic for that class)
- Over more than 2 classes (TBI is the topic of the whole unit)

If TBI is covered in one class, approximately how many minutes are devoted to TBI?
- Less than 10
- 11-30
- 31-60
- 61-90
- More than 90

Does another faculty member currently teach this course?
- Yes
- No

Is the course undergraduate or graduate level?
- Undergraduate
- Graduate

Please list the text and other resources (web, books, handouts, etc.) used in these courses.

__________________________________________________________

May we contact you for a short 5 minute follow-up interview?
- Yes
- No

Contact Information: __________________________________________
APPENDIX B. TEACHER CANDIDATE KNOWLEDGE QUESTIONNAIRE

Teacher Candidate Knowledge Questionnaire

Your Current Program:
- Undergraduate Program
- Graduate Program
- General Education
- Special Education


Does your program offer training in traumatic brain injury (TBI)?
- YES
- NO

If YES, describe what kind of training you have received:
- class/seminar specifically devoted to TBI?
- survey class on disability?
- other(s) _______________________________________________________

Approximately how much class time was devoted to TBI? ______________________________

Please list the text used in your course: ______________________________________________

Please list any additional TBI resources that were used in your courses (e.g., websites, books, etc.):

_____________________________________________________________________________

Teaching Experience:

Have you completed your student teaching?
- YES
- NO
- In Process

If YES, during student teaching, did you work with a student with a TBI?
- YES
- NO

Do you have teaching experience?
- YES
- NO

Number of years teaching in schools: ________________

Approximately how many students with TBI have you worked with in a school setting?
- none (0)
- few (1-5)
- several (6-10)
- many (>11)

Personal Experience:

Do you have a close friend or family member who has ever sustained a:
- Concussion/mild brain injury
- Moderate-severe brain injury

Have you ever sustained a:
- Concussion/mild brain injury
- Moderate-severe brain injury

_____________________________________________________________________________
<table>
<thead>
<tr>
<th>SECTION 1</th>
<th>True</th>
<th>Probably True</th>
<th>Probably False</th>
<th>False</th>
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</thead>
<tbody>
<tr>
<td>1 TBI is equally common in males and females.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
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<td>2 A child/adolescent in a coma is usually not aware of what is happening around them.</td>
<td>☐</td>
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<td>3 After a brain injury, children/adolescents can forget who they are and not recognize others, but be ‘normal’ in every other way.</td>
<td>☐</td>
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<td>4 A brain injury affects girls’ and boys’ brains differently</td>
<td>☐</td>
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<td>5 Even after several weeks in a coma, when children/adolescents wake up, most recognize and speak to others right away.</td>
<td>☐</td>
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<td>6 After a brain injury, it is usually harder to learn new things than it is to remember things from before the injury.</td>
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<td>7 A child/adolescents ’s pre-injury status (i.e., intellectual and emotional functioning) is likely to impact recovery from brain injury.</td>
<td>☐</td>
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<td>8 Children/adolescents who have had one brain injury are more likely to have a second one.</td>
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<td>9 Complete recovery from severe brain injury is not possible no matter how badly the child/adolescent wants to recover.</td>
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<td>10 Children/adolescents are likely to recover more completely from a brain injury than adults due to the greater plasticity of the young brain.</td>
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<td>11 A child who acquires a brain injury between 12 and 16 will typically present an even pattern of academic strengths and weaknesses.</td>
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<td>12 A child’s brain, unlike an adult’s, is able to “bounce back” after a brain injury.</td>
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<td>13 It is common for children/adolescents with brain injuries to be easily angered.</td>
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<td>14</td>
<td>Fluctuation among cognitive abilities is a finding typical of children/adolescents who have a brain injury, and not typical of the general population of children/adolescents.</td>
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<td>15</td>
<td>When children/adolescents are knocked unconscious, most wake up quickly with no lasting effects.</td>
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<td>16</td>
<td>It is important to provide many details when delivering instructions to a student with brain injury.</td>
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<td>17</td>
<td>Greater variability exists in the population of students with TBI than exists in populations of other students with disabilities.</td>
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<td>18</td>
<td>The only sure way to tell if someone has suffered brain impairment from a brain injury is by an X-ray of the brain.</td>
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<td>19</td>
<td>Knowing the location of brain injury resulting from TBI helps in the development of programming to meet a student’s needs.</td>
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<td>20</td>
<td>Many students with TBI display characteristics similar to those of students with LD.</td>
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<td>21</td>
<td>Knowledge of a student’s background prior to TBI is necessary when developing an educational plan.</td>
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<td>22</td>
<td>Medical labels that specify TBI as mild, moderate, or severe are useful for programming communication and academic services.</td>
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<td>23</td>
<td>The primary goal of brain injury rehabilitation is to increase physical abilities such as walking.</td>
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<td>24</td>
<td>Many students with TBI perform better in structured testing situations than they do in classroom settings.</td>
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<td>25</td>
<td>The challenges of students with TBI are typically more difficult to assess than the challenges of students with other disabilities.</td>
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<td>26</td>
<td>Most special and regular educators are knowledgeable about the speech, language, and cognitive communication problems associated with TBI.</td>
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<td>Students with TBI often have trouble forming and maintaining friendships.</td>
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<td>28</td>
<td>Recovery following TBI may continue for several years.</td>
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<td>29</td>
<td>Students with TBI often display behavior problems.</td>
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<td>30</td>
<td>Standardized tests are more beneficial than descriptive measures (e.g., language samples, interviews, checklists, observational techniques) in assessing cognitive deficits secondary to TBI.</td>
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