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Development and Psychometric Investigation
of an Arts Integrated Assessment
Instrument for Educators

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Abstract

The development and initial psychometric investigation of the Hocus Focus Analytics (HFA) Scale, an instrument to measure student growth and outcomes using an arts-integrated teaching approach, is reported. A 15-item instrument consisting of five subscales (cognitive, motor, communication, social skills and creativity) was developed to measure the outcomes of students (n = 31) with disabilities through the performance of four different magic tricks. The performance of each trick was assessed by the students' teachers (n = 4) at four different times for a total of 124 completed assessments using the HFA Scale. Results of the present study offer initial support for the psychometric properties of the HFA Scale. Internal consistency as measured by Cronbach's alpha was .91 for the total scale. The authors discuss the importance of using an instrument to measure student progress through a multidisciplinary, arts-integrated curriculum and future research implications.

An arts-rich environment produces a setting conducive for learning, and, consequently, students of all abilities thrive (Brown & Vaughan, 2009; Eisner, 2004; Fiske, 1999). Considering what is known about multiple intelligences (Gardner, 1993) and alternate ways of learning, the arts serve as an ideal vehicle to impart knowledge to a wide variety of students, including those with diverse learning needs. According to Gerber and Horoschak (2012), “The arts have always provided a visual, auditory, or movement approach to learning and they use sensory modalities that reinforce concepts and teach to the students’ strengths” (p. 125). The National Art Education Association (NAEA, 2010) has an equally compelling position on the value of early childhood art education, stating that it is essential to early learning. According to the NAEA (2010), the arts (1) support multiple ways of knowing and learning that are inherent in the unique nature of each child; (2) empower children to communicate, represent, and express their thoughts, feelings and perceptions; (3) offer opportunities to develop creativity, imagination, and flexible thinking; and (4) can enrich a young child’s understanding of diverse cultures.

The Multidimensional Value of an Arts Education

Widely known for his contributions to art education, Elliot Eisner was an unrelenting advocate for arts programs in schools. In his book, *The Arts and the Creation of the Mind* (2002), he expounded on the importance of the arts and their ability to develop thinking skills in children. Intrinsic to the arts is the construct that diversity, ambiguity, and variability are not only accepted, but encouraged. Eisner wrote,

The arts teach children that problems can have more than one solution and that questions can have more than one answer. The arts celebrate diversity. The arts celebrate multiple conceptions of virtue. They teach that there are many ways to see and interpret the world and that people can look through more than one window. Furthermore, this lesson is seldom taught in schools (p 9).

When students are encouraged to learn creatively using an arts-integrated teaching approach, they are provided with opportunities for development of their initiative and independence. When students are given permission to take risks and make mistakes, stressors such as the need to be right or perfect dissipate. According to Eisner (2002), we make learning about discovery, finding out what you don’t know when you allow yourself to think beyond the rules. Through mistakes, children develop resilience, flexibility, adaptability, critical thinking, and problem-solving abilities (Fiske, 1999). The arts have consistently been shown to engage curiosity, and arts-integrated approaches may be one method of improving learning outcomes (Chand O’Neal, 2014). Zinn (2008) reported that when students are allowed to complete a task or show understanding in a way that allows for creativity and self-expression, they are more motivated to learn and experience less anxiety. According to researchers at the University of Michigan (2018), children who explore the link between their creativity and curiosity are more likely to be better students. Providing students with stimulating classroom activities using an arts-integrated approach offers novelty, surprise, and complexity, allowing greater autonomy and student choice (Kaufman 2017). These activities also encourage students to ask questions, question assumptions, and achieve mastery through process, product, and revision rather than traditional testing where all answers must be right (Kaufman, 2017).

Performing Magic as a Multidisciplinary Art Form

The art of magic is considered one of the oldest and most universal of the performing arts, because it can easily translate from one culture to another. The earliest recorded demonstration of a magical performance can be found in the Westcar Papyrus (3000 B.C.), which illustrates a magician performing in the Pharaoh's court (Christopher & Christopher, 2005). Magic's history can be traced from prehistoric cave paintings in Southern France and Northern Spain through the streets and marketplaces of ancient Rome and Greece. Magicians have been called the "scientists of show business," because their illusionary masterpieces require the knowledge and application of mathematics, science, and engineering (Christopher & Christopher, 2005). Teachers who take advantage of the multidimensional features of learning a magic trick employ instructional practices that develop skills in storytelling and performance. While lessons initially focus on recalling the steps required to make a trick work, students must create a story along with a script designed to entertain an audience (Spencer, 2009). After all, a magic trick in and of itself is not an art; however, when combined with the elements required for a practiced performance, it is theater.

In the late 20th century, a modest number of education researchers evaluated the effectiveness of using magic tricks with students diagnosed with learning disabilities. The results indicate that: (1) magic tricks offer a creative means for stimulating the senses in special education students (Frith & Walker, 1983); (2) magic tricks enhance the learning experience and encourage creative problem-solving skills, observational techniques, and critical thinking (McCormack, 1985); (3) magic tricks provide a strategy for building teamwork and self-esteem in children with Emotional Behavior Disorders (Broome, 1989); and (4) teaching magic tricks in an educational setting can help students with learning differences attain higher self-esteem and self-confidence (Ezell & Ezell, 2003). While these studies showed positive results, no subsequent research was conducted for several years.

More recent research has determined that using a magic-trick based curriculum in which academics and functional skills are embedded into learning and performance encourages students to create a context and communicate that through movement and storytelling (Balmer, 2014; Spencer, 2012). The very nature of the arts involves the integration of multiple disciplines, thereby creating a perfect opportunity to utilize a multidisciplinary approach to instruction. Art disciplines that involve a performance component, like performing magic tricks, require students to combine diverse skill sets, including cognitive, communication, and motor in an interactive social situation through creative expression.

The Efficacy of an Arts Curriculum for Children with Disabilities

Decades of research reveals the arts are closely linked to academic achievement and social/emotional development for students in the general education classroom (Smith, 2009). The Arts Education in Maryland Schools Alliance (AEMS) completed a meta-analysis that includes 62 arts education studies. Their findings document more than 65 distinct connections between student learning and the arts to a wide range of academic and social benefits (Ruppert, 2006). Based on these findings, six major types of benefits were identified: reading and language development, mathematical skills, thinking skills, social skills, motivation to learn

and to achieve, and positive school environment (Ruppert, 2006). However, limited studies have been done on the impact of the arts on students with disabilities.

While participating in a study using videoconferencing to link two self-contained classrooms of students with disabilities from different regions in the U.S., the researchers recognized significant growth in student skills through the learning and performance of a magic trick. This progress was also acknowledged by the teachers affiliated with each group of students. The use of recordings of each session allowed the researchers to more fully examine outcomes as students progressed through the magic trick-based curriculum over a period of 12 weeks. Improvements were seen in five areas: cognition, motor skills, communication, social skills, and creativity. The lack of an available validated instrument to capture these results compelled the researchers to develop and investigate the Hocus Focus Analytics (HFA) scale.

Cognitive Development Through the Arts

Previous research has found that children with disabilities can achieve cognitive growth through an arts training approach (Posner, Rothbart, Sheese, & Kieras, 2008). In 2008, the Dana Foundation, an organization committed to advancing brain research, released the findings of the Dana Arts and Cognition Consortium (Posner et al, 2008). Neuroscientists from seven universities across the United States were brought together to study the relation between the arts and higher academic achievement. The collection of studies shows remarkable links in cognitive development associated with the arts including: (1) the ability to manage information in both working and long-term memory, (2) reading acquisition and sequence learning, (3) links with geometrical representation, and (4) learning by physical practice that neuroscientists believe may transfer to other cognitive skills (Asbury & Rich, 2008).

MacLean (2008), in her study on the impact of an arts-based curriculum on students with disabilities, also found that the arts can contribute to the development of cognitive abilities and provides students with the cognitive tools needed to make sense and meaning of the world. According to MacLean (2008), "The ability to perceive many possibilities without having to decide which one is right promotes flexibility of thinking that can be transferred into areas outside of art activities" (p. 78). Dorff (2012) found that, in an art class, creative approaches are valued over those that follow a standard format, because children with disabilities are able to celebrate the uniqueness of their work rather than conform to predetermined responses. Researchers at the UC Davis Center for Neuroscience confirm these findings, citing that being in a curious state helps the brain better encode information, and, consequently, individuals demonstrate increased learning (Fell, 2014). The arts have consistently been shown to engage curiosity (Fiske, 1999) and arts-integrated teaching approaches may be one method of improving student learning (Chand O'Neal, 2014).

Posner et al (2008) developed a theory on arts training that states that: (1) there are specific brain networks for different art forms; (2) there is a general factor of interest (curiosity) or openness to the arts; (3) children with high interest (curiosity) in the arts, and with training in those arts, develop high motivation; (4) motivation sustains attention; and (5) high sustained motivation, while engaging in conflict-related tasks, improves cognition. They concluded that arts training is especially beneficial for children with attention-deficit hyperactivity disorders (ADHD) and "that arts training works through the training of attention to improve cognition for children with interests and abilities in the arts" (Posner et al, 2008, pg. 11). Further results of

the study by Posner et al (2008) confirm that children with disabilities are able to achieve cognitive growth through an arts training approach. This is not surprising when you consider that Panksepp (2008) found that active involvement in activities associated with the arts selectively stimulates nerve growth in regions of the brain where emotions, cognition, and executive functions are processed as well as those regions that are directly linked to motor control, coordination, attention, and language processing.

Research has determined that using a magic-trick based curriculum in which academics and functional skills are embedded into learning and performance can capture a child's curiosity (Singh, 2014), help them better learn and retain information (Kaufman, 2017; Singh, 2014), and encourage them to create a context and communicate that through storytelling (Balmer, 2014; Spencer, 2012). The nature of performing a magic trick exceeds merely being able to remember and sequentially execute the steps. The performer must also be able to engage the audience through the telling of a story (patter) and appropriate gestures to emphasize the impossibility of the presentation. The combination of these elements in a single task provides unique opportunities for students with disabilities to develop and improve deficits in their cognitive abilities.

Motor Development Through the Arts

While research establishing a direct relation between the arts and its impact on motor development in an academic setting is limited, there have been numerous advances in the development and implementation of creative arts therapies for children with disabilities by occupational therapists and speech language pathologists. An extensive review of programs and practices integrating the arts and medicine by Chema and Schogl (2014) revealed measurable outcomes in improved motor and social functioning for youth with disabilities.

Koster (2012) demonstrated that art activities promote the development and growth of fine and gross motor skills in children. Mills (2014) states that the arts engage children across all domains of development including fine and gross motor skills. Participation in the arts has been shown to assist in the development of complex motor skills (Drower, 2012) and improve motor control, visual motor integration, and muscle development (Georgetown Behavioral Health Institute, 2016). The use of magic tricks as a therapeutic technique is supported by the American Occupational Therapy Association (AOTA). Carolyn Baum, past President of the AOTA, stated in a 2007 interview in *ADVANCE for Occupational Therapy Practitioners*, "The underlying concepts in magic target areas of motor, psychosocial, cognitive, and sensory processing [skills] that lend themselves well to intervention (Fisher, 2007)."

Communication Development Through the Arts

Students with disabilities often need alternate ways to communicate their thoughts, knowledge, and ideas. According to Illeris (2011), the performative aesthetic learning process provides opportunities for children to demonstrate knowledge through symbolic forms (e.g. movement, music, storytelling, visual and performance art). She concluded that integrated arts experiences build confidence, promote problem solving, and engage the brains of students by tapping their curiosity, intrinsic motivation, and personal interests, all of which provide a strong foundation for them to become confident, independent learners (Illeris, 2011).

Anderson and Berry (2017) reported that the same theater techniques that are used in the presentation of a magic trick (creative writing, improvisation, character development, speaking skills, etc.) suggest that the arts may act as scaffolding for language development and communication in addition to improved perceptions of self-efficacy, self-esteem, and self-confidence.

Social Skills Development Through the Arts

The arts provide students with an opportunity to find their voice and to develop a different identity or self-concept that is in harmony with their abilities. Children with disabilities are often narrowly associated with their disability label, especially in the school setting that provides little regard for their potential or actual abilities.

All children, including those with disabilities, use art and the process of creating art to communicate information about themselves and their world and to express emotion in appropriate ways (Mason, Steedly, & Thormann, 2008). The arts can help them build resilience, contributing to the development of emotional regulation, peer relationships, and positive well-being (Lester & Russell, 2008). Engagement with an arts curriculum results in positive effects in children's critical capacity for decision-making and problem solving, which are important developments for preparing children with disabilities to be active and independent citizens. (Mason et al, 2008).

In a literature review and gap analysis conducted by the National Endowment for the Arts' Office of Research and Analysis, Metzger (2015) concluded that exposure to assorted arts programs reveals positive growth in children's social and emotional skills. After using a creative drama training program, Erbay and Yildirim (2010) found a significant improvement between pre and post assessment on the social communication skills (initiating conversation, classroom engagement, and group inclusion) of children with disabilities. Duffy and Fuller (2010) investigated the impact of music on the social skills of children with moderate intellectual disability. The results indicate significant improvements in social initiation, eye contact, imitation, and turn-taking. Spencer (2012) found that teaching children with disabilities to perform simple magic tricks addresses competencies critical to social and emotional well-being, including: (1) motivation, concentration, and group participation; (2) leadership and social skills; (3) positive peer relationships, peer mentoring, and peer collaboration; and (4) positive student behaviors. Yazici (2017) analyzed the impact of an eight-week art education program on the social skills of children. Pre and post intervention comparison of ratings on the Social Skills Evaluation Scale (SSES) showed the program significantly improved student's overall scores as well as having an impact on their social skills in all domains.

Challenges for Arts Integration

While there is considerable theoretical support for the arts in education, robust research designed to examine the relation between engaging in an arts curriculum and student learning is necessary (Upitis, 2011). Walker (2014) examined current conditions of the arts in schools and found that 50% of elementary teachers believed that the arts were marginalized in their schools, and 81% reported a specific focus on language and math rather than other subjects. Over 60% of middle school teachers and 54% of high school teachers shared the same view. In the current environment of accountability in education, it has become increasingly important to

link interventions to improved student outcomes. If the arts have any hope of remaining relevant in our schools, teachers must be able to demonstrate the effectiveness of an arts-based curriculum across multiple dimensions, including cognition.

Arts educators know the importance of well-organized and structured activities that engage multiple modalities, allow for creative expression, and provide opportunities for students to communicate ideas and emotions. In their review of the literature, the researchers found a lack of assessment tools available to educators that effectively measure these variable ways in which children develop skills through the arts. The current culture of accountability places limitations on the time devoted to the arts in our schools, making it imperative that teachers accurately reflect student progress through the arts.

The present study was conducted to develop a reliable instrument that captures student progress in the areas of cognition, motor skills, communication, social skills and creativity while completing a magic trick. The instrument is designed to inform all individuals in a transdisciplinary approach, thereby creating opportunities for generalization across settings based on the information obtained from the scale in the various dimensions.

Methodology

This study reports on the development of a 15-item measure, Hocus Focus Analytics (HFA), designed to capture student progress across five identified dimensions through an arts-based theme of magic tricks.

The researchers organized the methodology into five areas: item development, expert raters, measures, participants, and curriculum.

Item Development

Two members of a three-person research team developed the items, and the third team member completed the statistical analysis.

Two of the team members generated a total of 58 items representing five dimensions (cognition, motor skills, communication, social skills, and creativity). The five dimensions were chosen based on academically and therapeutically accepted areas of child growth and development that are common in the field of special education (U.S. Department of Education, 2018). The cognitive dimension evaluates students' ability to organize, sequence, remember, identify/name, follow directions, and concentrate on a task. The motor skills dimension encompasses students' dexterity, gross/fine motor coordination, strength, and their ability to engage in purposeful movement. The communication skills dimension evaluates students' ability to communicate effectively with others with whatever means are typically utilized for each learner (language, adaptive devices, sign language, etc.). The social skills dimension includes students' ability to interact with others, engage in conversation, and participate in social activities. The creativity dimension refers to students' ability to use ideas or concepts to problem solve, strategize, and develop novel approaches, to be flexible in thinking and readjusting and amending procedures.

Expert Raters

A back translation of the items into each of the five areas was performed to assess the Hocus Focus Analytics (HFA) scale content validity. Thirteen expert raters (six identified as higher

education professors in Special Education, six as K-12 Special Education teachers, and one as a Board Certified Diagnostician) were provided with a link to the 58 survey items (Appendix A) through Survey Monkey. The 13 raters independently identified each item as representing one of the five dimensions. Definitions for each dimension were provided to the raters. Incomplete ratings were not included in the final analysis.

Frequencies were computed on the completed back translation data. A priori, the research team decided to retain items if a minimum of 70% of the raters endorsed an item as reflecting its theorized dimension. Previous studies have used this percentage when choosing to retain items after completing a back translation (Kelley, Gelso, Fuertes, Marmarosh, & Lanier, 2010). Based on this procedure, the measure was reduced to 35 items: 12 items representing the cognition scale, 6 the motor skills scale, 5 the communication skills scale, 5 the social skills scale, and 7 the creativity scale. (Appendix B).

Measures

Teacher Demographics. A questionnaire was used to gather basic teacher demographic information, such as gender, age, race, certifications, and teaching experience.

Student Demographics. A questionnaire was used to gather basic student demographic information, such as gender, age, race, and disability classification.

Hocus Focus Analytics. A 35-item instrument (Appendix B) with five subscales was developed to measure student progress using the Hocus Focus arts-based protocol.

Participants

Teachers. Participants were selected from a group of candidates who were attendees at the Midwest Symposium for Leadership in Behavior Disorders annual conference and who expressed an interest in participating in the study. Each participant took part in a professional development training session on implementing the Hocus Focus curriculum in the classroom and using the print version of the HFA scale. The research team developed selection criteria that would provide for a culturally and linguistically diverse student sample. Selection criteria included: (1) the diversity of students at the teachers' school; (2) the location of the school (rural, suburban, urban); (3) understanding of the Hocus Focus arts-based curriculum and HFA scale; and (4) willingness to follow the 11-week teaching schedule provided by the research team. The participants selected for this study included five special education teachers working at five different elementary schools in the Midwest. Of this sample of teachers, four (80%) were female and one (20%) was male ranging in age from 26-64, with a mean age of 46 (SD = 16.08). The entire sample of teacher participants was White/Caucasian (non-Hispanic).

Students. The students who participated included 8 females and 23 males ranging in age from 7 - 14, with a mean age of 9.6 (SD = 2.3). The majority of the sample was White/Caucasian (non-Hispanic) (8.6%; n = 25). Other racial groups represented included Black/African American (non-Hispanic) (9.7%; n = 3); Latino/Hispanic (3.2%; n = 6); and Biracial (3.2%; n = 1). All but one students' first language was English. All the students were identified as requiring special education services because of their diagnoses (9 developmental disabilities, 6 speech/language impairments, 5 multiple disabilities, 4 ASD, 2 EBD, 2 LD, 1 Down Syndrome, 1 Fetal Alcohol Syndrome, and 1 Other Health Impaired).

Curriculum. In 2009, Spencer designed a magic trick-based curriculum that uses a holistic philosophy essential to effective educational experiences that are generalizable for children with disabilities. Each lesson (Appendix C) is designed to provide opportunities for students to learn through modeling, coaching, and scaffolding, while increasing the complexity of new tasks. Each of the eleven tricks in the curriculum allows students to build on previously learned knowledge. As the tricks become increasingly more difficult, they expand opportunities for creative expression and progress.

Procedure

During the annual gathering of the Midwest Symposium for Leadership in Behavior Disorders, a professional development workshop on the implementation of the Hocus Focus curriculum and the HFA scale was offered to special educators from 15 states. Forty-six of the educators who participated in the training session expressed an interest in being involved in future research. From this group, five were selected to participate in this study using the established criteria referenced above.

Prior to the beginning of data collection, consent forms were sent home to the parent(s) or guardian(s) of each student, and 31 signed consent forms were returned. One teacher was transferred to a different school, and another was unable to secure the required student consent forms. Both had to drop out of the research study. The four remaining teachers received all materials and supplies necessary to implement the magic trick-based curriculum 45 days prior to the commencement of the study. Direct communication with the research team and participating teachers was established using one-to-one email correspondence. Given the small number of teacher participants, group emails were also used to create a community of practice and an open environment for the expression of comments, concerns, and questions. This level of communication contributed to the fidelity of implementation, consistency of instructional methods, and increased level of agreement between raters (inter-rater reliability) when using Hocus Focus Analytics.

The Hocus Focus supplemental curriculum includes a teacher's manual, student handouts, illustrated directions for each trick, and a DVD with instructional videos that ensure teachers will implement the program with fidelity. Teachers provided weekly instruction to the 31 students on how to perform the magic trick included in the lesson of the week (Appendix C). Teachers evaluated four magic trick performances of each of the 31 students and recorded their evaluation of the performances using the 35-item Hocus Focus Analytics performance scale (Appendix B).

Before the intervention began, the research team used the print version of the 35-item HFA scale to design a secure, web-based application. Teachers were encouraged to use this application alongside the print version to make data collection more efficient. After the first performance, teachers transferred their student's performance ratings from the print version of the HFA scale to this web-based application. However, unfamiliarity with the application and the use of reversed scoring on some items proved to be confusing. Reverse scoring results when negatively worded items required a reverse score. (For example, a score of 4 on a negative item would convert to a 2 in the application.) The application design also proved to be time consuming for the teachers. Therefore, the research team designed an alternate, printed Excel spreadsheet incorporating the 35 items of the HFA scale. Teachers were asked to use this

spreadsheet when recording their ratings of the second, third and fourth magic trick performances instead of the web-based application. This method was more efficient and user-friendly for the teachers. The research team collected the printed spreadsheets and entered the data collected into the HFA web-based application for analysis in SPSS.

Results

Item Analysis and Reliability

Because the HFA scale was a theoretically derived instrument with five hypothesized subscales, an item analysis was used. The purpose of item analysis is to choose items that relate best to the hypothesized construct (Gorsuch, 1997). Using item-total correlations to evaluate items is a special case of factor analysis. Each item is correlated with the total score, and items with the highest item-total correlations are chosen as representative of the construct in question. Item reduction for the five subscales of the HFA scale was based on analysis of each item's contribution to internal consistency and the correlation of each item with the total scale score. As noted, the original 58-item measure was reduced to 35 items after the back translation. A priori, it was decided that the final instrument should contain 15 items (3 items for each subscale) (Appendix D). It was agreed that a 15-item scale would combine maximal reliability with ease of usage. When selecting the three items for each dimension, the following rules were used: (a) no item-total correlations on each dimension could be less than .40 for accepted items; (b) the items with the highest item-total correlations would be selected; (c) because of confusion surrounding the automatic reverse scoring of items, the number of reversed scored items would be limited to one per subscale; and (d) if items chosen were redundant with each other, those with the highest item-total correlation would be retained, and items deleted would be replaced with those that had the next highest item-total correlation.

Item-total correlations for the Cognitive scale ranged from .51 - .71; for the Creative scale, .65-.76; for the Motor Skills scale, .44-.53; for the Communication Skills scale, .56-.66; and the Social Skills scale, .54-.63.

Internal consistency as measured by Cronbach's alpha was .91 for the total scale; .80 for the Cognitive scale; .87 for the Creative; .79 for the Motor Skills scale, .63 for the Communication Skills scale; and .73 for the Social Skills scale.

Table 1. Means, Standard Deviations, and Item-Total Correlations for Items of the HFA Scale

Item Number	Mean	SD	Item-Total Correlation
Cognitive Subscale			
1 - Recalls the steps independently without hesitation	3.83	1.13	.70
3 - Is able to remain focused for the duration of performing the steps	4.34	.88	.51
11* - Requires some verbal prompts when performing the trick	3.62	1.20	.71
Motor Skills Subscale			
20* - Performs trick but requires physical prompts	4.34	1.08	.46
21- Does not require some hand over hand assist when performing the trick	4.07	1.45	.53
24 - Maintains proper physical position independently	4.36	1.08	.44
Communication Skills Subscale			
25 - Articulates the story correctly.	3.31	1.11	.66
26 - Uses complete sentences to articulate the steps when performing the trick.	3.55	1.06	.58
29 - Describes why the secret move works.	2.15	1.17	.56
Social Skills Subscale			
30 - Captures the attention of the audience and sustains it throughout the trick.	3.57	.85	.63
33 - Identifies the audience perspective	2.52	1.05	.54
34 - Initiates showing the trick to others	2.92	1.13	.58
Creativity Subscale			
12 - Is able to recognize alternative possibilities in presentation	2.37	1.31	.69
14 - Is able to make adjustments while performing the trick	2.75	1.22	.76
15 - Includes unique elements (items) when performing the tricks	2.05	1.23	.65
Note. * = Reverse scored item			

Table1.

Table 2. Means, Standard Deviations, and Internal Consistency Estimates for the HFA Subscales and Total Scale

	M	SD	α
Cognitive Subscale	11.80	2.73	.80
Motor Skills Subscale	12.77	3.05	.79
Communication Skills Subscale	9.01	2.54	.63
Social Skills Subscale	9.01	2.45	.73
Creativity Subscale	7.17	3.34	.87
HFA Total Scale	49.75	11.26	.91

N = 122; HFA = Hocus Focus Analytics.

Table 2.

Discussion

The goal of this research study is to develop an effective instrument (Appendix D) that, when utilized by teachers in the inclusive classroom, could capture student progress across five dimensions using a multidisciplinary arts-based curriculum using magic tricks. Because a magic trick is not simply about knowing the secret or executing the moves, students are required to utilize and integrate a variety of skills that result in a performance to create the illusion. The student may be able to tell you the secret to the trick and correctly execute the moves; however, the expectations of the arts-based curriculum used in this study requires students to develop their performance and presentation skills. This necessitates that students also create a “patter” that captures the attention of their audience as well as execute the moves required to create “the magic.” Therefore, the primary goal of the researchers was to develop an instrument that captures student growth in these dimensions: cognition, motor skills, creativity, communication skills, and social skills.

Classrooms are dynamic learning spaces that require teachers to be actively attentive. This places limitations on the amount of time teachers have available for accurate assessment of student progress. Understanding this reality, the authors’ intent was to develop a scale that could easily reflect student progress without placing additional burdens or unrealistic demands on teachers’ time and attention. Anecdotal reports from teachers in this study indicated the scale was easily administered and provided them with relevant information. However, they also found it more convenient to use the scale in its paper form rather than entering the data directly into the HF Analytics web-based application. Items that were reverse scored created

confusion, and, consequently, reduced the teachers' confidence in accurately recording the results. As a result, the researchers supported the teachers' use of the paper instrument so as to ensure continued integrity of the data.

Student Progress

Although this study did not focus specifically on student progress, teachers were enthusiastic about the positive outcomes students were demonstrating in each of the identified skill areas. One teacher wrote,

The enthusiasm and engagement of the students was very apparent during this class time! My students couldn't wait for the next opportunity to try a new magic trick. What excited me the most was seeing the creativity and growth in their story creations, manipulation of the magic tricks, and their amazing presentations. For some of our students with a language impairment, presenting in front of an audience can be especially difficult. However, when performing their magic tricks, they were able to create and perform their story and magic trick with ease.

Feedback from the teachers indicated that they compared student progress by reviewing each of the data collection points, but their examination was limited to single item comparisons. If they had made use of the HF Analytics application, their examination would have also included the aggregated and disaggregated progress of each dimension (Appendix E). Furthermore, the reluctance to use the application limited their ability to share visual representations of student growth with parents, administrators, related service providers, and the students themselves. Recognizing this concern, the researchers redesigned the application to be a more user-friendly data collection tool accessible using a handheld smart device (CPR, 2018). This will allow teachers to immediately share progress with students and stakeholders.

Limitations of the Study

There are several limitations in this study that should be addressed. It involved a relatively small sample size of teachers and students. Although the sample size was small, it is within the appropriate guidelines for a development study of this type. There is uncertainty of the role the increasing complexity of the magic tricks may have had on the measurement of student growth. Because of this, the statistical analysis was applied to each data collection associated with a specific trick rather than the aggregate. Interestingly, the researchers also recognize that when the magic trick being learned was more cognitively and motor challenging, there was an increase in the communication and social skills subscales (Appendix F). This observation may be worthy of future exploration.

Finally, the student sample included only children who had limited verbal communication skills. No one in this study used Augmented and Alternative Communication (ACC) devices, which was not anticipated by the researchers. This impacted the two items (Appendix B, Items 403 and 404) contained in the communication subscale dealing with ACC devices that became irrelevant in measuring student progress in this dimension.

Future Implications

The intent of this study was to develop an assessment instrument that would capture student progress using an arts-integrated teaching approach. The HFA scale was designed for use with a specific performance-based arts curriculum focusing on magic tricks. However, engaging teaching artists and educators to conduct similar studies to explore how the subscales of the HFA instrument might be adapted to other art disciplines is a logical consideration for the future.

Although this study meets the criteria to determine content validity and reliability of the HFA Scale, further research is necessary to determine construct validity. Ultimately, the next steps will be to: 1) employ the scale in an extensive study designed to compare student outcomes from the HFA scale to other validated instruments; and 2) gather information that will increase understanding of how an arts-based curriculum that is multidisciplinary in nature develops a range of practical skills for students with disabilities.

Two of the researchers are currently investigating the construct validity of the HFA scale using two validated measures and a more significant sample size of students. Teachers are using three instruments for data collection: (1) the Bilateral Coordination and Manual Dexterity subsets of the Bruininks-Oseretsky Test of Motor Proficiency-2nd Edition (BOT-2) to evaluate motor skills; (2) the Developmental Teaching Objectives Rating Form-Revised (DTORF-R) questionnaire to evaluate cognition, communication, and socialization; and (3) the HFA scale to assess cognition, motor skills, communication, social skills, and creativity.

Researchers redesigned the electronic data collection application so that all data is being entered digitally (Appendix G). To improve teacher efficacy, a digital learning environment has been created for educators who are interested in implementing the magic-trick based protocol, the HFA scale, and HF Analytics. This will ensure teachers have a better understanding of the features of the web-based application and the quantitative and qualitative evaluation tools available to them. This training also prepares them to generate visual representations of student progress and create an electronic record that can be viewed by all members of the transdisciplinary team, including the student, parents, therapists, and other stakeholders through a secure relational database.

Future applications of the instrument may be used by additional special education service providers other than teachers. These may include therapists, psychologist, counselors, and other medical professionals. As a member of a transdisciplinary team, the student progress information would be used to inform other service providers of successful strategies to improve learning and opportunities to help students achieve related goals and objectives. The ability to share visual representation of student progress and anecdotal notes has the potential to enhance generalization of these skills (Appendix E).

In a culture of standardized assessment that dictates funding for school programming, it is essential that the value of the arts is recognized as being an effective instructional method that improves students' learning outcomes beyond the art discipline itself. The HFA scale can provide educators with a powerful tool to effectively persuade decision-makers who control budgets and resources in the benefits of investing in multidisciplinary, arts-integrated curriculums for diverse learners.

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