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Creativity Advances Logical, Spatial, and Aesthetics Cognitive Abilities Through Self-Reflection and May Improve Spatial Sequencing Memory

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Abstract

Creativity is defined as the ability to make new things or think of new ideas using multiple human aptitudes; it is inventiveness. Therefore, an important part of understanding creativity is through the self-reflection of your own cognitive components of logical, spatial and aesthetics thinking, which requires the cortical processes of spatial sequencing memory and affective symmetry gauging. Creativity is relevant to the global community and international education because it is an inherent human expression. A case study of the experience of the art teachers at the John Langdon Down Foundation A.C. (JLDF) Mexican art school (who chose to undergo a meaningful and emotional journey of self-reflection) is the account of the development of a novel visuospatial and bodily kinetic curriculum for the JLDF art students with Down syndrome that seemed to improve both the teachers' and students' creativity, self-efficacy and spatial sequencing memory.

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Background

The subject of teaching creativity in the classroom is at the forefront of global educational aims. The 2019 World Education Conference to be held in Toronto, Canada has as the primary focus for the international community of teachers and teacher administrators, "Creativity, Collaboration and Community for You to Stop Planning Meetings and Start Designing Experiences" (WEC 2018). This world class organization provides validation of the recognition of the importance for teachers and teacher administrators to shift the status quo of too much static curriculum to dynamic experiential learning that has creativity as a core feature in the classroom.

An exploratory case study documents the phenomenon of teaching creativity in the classroom. The investigation was the study of two Mexican art teachers to find out about their experiences of self-reflection and how it affected their self-efficacy to be creative teachers in the classroom. This is true for the continuum of all students, such as persons with disabilities, for example, Down syndrome. See Appendix A for the glossary of terms used in this case study.

Persons with Down syndrome have physical and mental challenges. Nevertheless, there has been significant improvement since the 1950's in the development of curricula for this marginalized population due to better social and empirical understandings of the condition (Leshin 2003). At the John Langdon Down Foundation (JLDF) School the art students have demonstrated significant creative artistic talent and improvement over the years since the art school began in 1994. The art teachers, Daniel Perez and Alan Planells, have developed, during the 25-year history of the art school, a unique visuospatial and bodily kinetic program for their students, who are persons with Down syndrome. In the beginning of the art school, it was

necessary for the art teachers to reverse their prior understandings of how the art principles were traditionally taught. The reason was because the students were not able to learn even the most basic artistic concepts due to cognitive disabilities.

The art teachers redesigned their curriculum to accommodate the visuospatial and bodily kinetic aptitudes of the art students. These aptitudes relate to the making of art because of the actions of proportional gauging. Proportional gauging is an action taken while making artworks (although it is not limited to just making artworks) and can be said to be an affective symmetry gauging. The concept includes the innate positive emotional response to the mathematical construct of the division in mean and extreme ratio (DEMR) (Bouleau 1963; Fechner 1865; Ferg 2011, 2018; Green 1995). Fundamental to the action of affective symmetry gauging is the use of spatial sequencing memory, for most artistic methods, one must have an ability to remember the artistic plan one has simultaneously while one is creating one's artwork (Ferg 2018). Persons with Down syndrome have a similar mental age for typically developing individuals in regard to spatial sequencing memory (Yang, Conners, and Merrill 2014).

In order for the Mexican art teachers to achieve a new direction in their curriculum, they personally experienced a level of self–reflection that they contend was an essential component of their new ability to teach the JLDF art students.

Teachers must demonstrate expertise in the subject matter they are licensed to teach. Whether or not it is essential for a teacher to have the ability to be creative in the classroom has not been explicitly determined only implicitly suggested within teacher development programs (Rinkevich 2011; Simplicio 2000). That is partially because of two factors, first, there is not an operational definition of the concept of creativity that is measurable, and second, the

effect of the use of creative ability is still debated in education due to the lack of focused research on the potential need in the classroom. An investigation of the physiological basis of the cognitive aspects of visuospatial and bodily kinetic aptitudes must be shown to correlate with traditional academic standards for verbal and math skills to increase research interest. In other words students need to learn how to read, write, understand mathematics and how to create.

Education Research

Whereas, most teachers do not currently have visuospatial and bodily kinetic curricular designs that address the aptitudes nor how they may best connect to linguistic and math subjects (Gardner 1983); it is necessary to develop further an epistemology (Eisner 1994). National assessments for giftedness do not correlate the verbal and math skills with visuospatial and bodily kinetic abilities. Students who score high on visuospatial assessments don't necessarily repeat, at the same level, giftedness in linguistics and mathematics (Lubinski 2003). This is because visuospatial ability is not solely based on a "g" factor of intelligence (Eisner 1986, 2002; Lubinski 2003).

Elliot Eisner's four dimensions of education criticism and connoisseurship (Eisner 1994), Michael Patton's evaluative approach to teacher awareness (2002) and bell hooks' freedom in the classroom dialogue (hooks 1994) are programs of study designs that incorporate the factors of visuospatial and bodily kinetic aptitudes. The strategies used by these educators can be organized into a cohesive education model of how to bridge and combine the various multiple intelligence (MI) aptitudes (Gardner 1983). Visuospatial curriculum is a form of representation (Eisner 2002) that addresses the psychological behaviors of learning for teachers and students

in the same manner as artists engage viewers in the participation of an aesthetics experience of creativity (Eisner 1994, 2002). Therefore, the artistic venue is a crucial example to develop further in education to increase the knowledge-base for teaching creativity in the classroom.

Specifically, the process of self-reflection enables both teachers and students (Sowder 1998, 2007) to facilitate cognitive connections between their logical, spatial, and aesthetics thinking (Ferg 2018). Neuroaesthetics evidence about human perceptual abilities is presented to further clarify the perspicacity of the consciousness behaviors of teaching and learning, which are reciprocally related to one another. The self-reflective process allows teachers greater awareness to be able to connect the logical, spatial and aesthetics components directly to the linguistic and mathematics realms with the visuospatial and bodily kinetic curricula. In other words, if you can perceive it; you can know it. An example of related curriculum designs by international educators is listed in Appendix B.

Creativity

Research on the necessity for teachers to have the knowledge of how i.e., practical applications, to design creativity into their curriculum is relatively new in pedagogical studies. Investigators report that the prototypes of teachers, who have demonstrated a creative manner of teaching, have been studied and analyzed for their behavioral models of integrated academics and innovative teaching in order to enhance student learning. Currently, it is required by national and state standards in education for teachers to be competent in their content areas. The level of praxis is determined and assessed for all teachers through the accreditation of schools and colleges. There is no accredited system in place to assess the level

of creativity a teacher should demonstrate in their pedagogy or in the development of curriculum for a creative classroom.

In 2015, Cynthia Luna Scott reported for the United Nations Educational, Scientific and Cultural Organization (UNESCO) that the complex global challenges societies face in the 21st Century are largely unanswered due in part to the static lecture and assessment models still in use worldwide. Her research showed that there is agreement in the global community for the need of creative solutions that may be achieved by the improvement of pedagogies that develop innovation (Scott 2015). Until the concept of teaching with creativity in the classroom has been academically reinforced by teacher administrators and evaluators as a requirement of teacher licensing and operationalized in the assessments, there will continue to be a lack of validation for the concept. Thus, the gatekeepers of creative curriculum designs may be teacher administrators who do not know of or accept this attribute in themselves.

Longitudinal research findings on the success of learning how to be innovative have been shown to be integrally tied to being creative (Esquivel 1995; Gardner 1983; Lubinski 2010; Rinkevich 2011). This means that learning literacy, mathematics and technology for students is dependent on the engagement of multiple aptitudes of cognitive abilities (Eisner 1994; Gardner 1983), which together help to induce ideation. The cognitive components of optimal human intelligence require a creative interpretation of pedagogy, curricular designs and the understanding of affective symmetry gauging and spatial sequential memory in order to achieve the full potential of a student's intelligence (Eisner 2002; Ferg, 2018; Gardner 1983).

The research question serving as the foundation for this thesis is, does the novel visuospatial and bodily kinetic curriculum designed by the two art teachers at JLDF, after an

intensive self-reflective focus, demonstrate the potential for teachers and students to improve cognitive abilities, such as, creativity, ideation, and spatial sequencing memory?

Approach

The methodology for this case study investigation is the qualitative Evaluative Approach of the interview process used for focus groups from Patton (2002). The rationale for this choice has been, first and foremost, that the data is archival. The situation of the teachers' experiences has already occurred. Due to the non-random (non-probability) of the data sources only a qualitative analysis can be made. Secondly, the Evaluative Approach for focus groups is appropriate because the art teachers were the individuals who experienced the intense self-reflection of their traditional training as artists and art teachers. The art teachers subsequently created, within the classroom environment and over time, a novel visuospatial and bodily kinetic curriculum that addressed the specific aptitudes of the Down syndrome students. The ancillary question was, how did they do it? Interviews with the art teachers followed the procedures set up for guided questions and discussion and revealed the key components of the teachers' insights (Patton 2002).

In addition, the observations of the art students while making the artworks were important to assess because, when they used affective symmetry gauging, this was a demonstration of the use of spatial sequencing memory (Ferg 2018). These observations add further documentation for the field of neuroaesthetics on the relationship of aesthetics and memory. Additional research questions seek to find answers to the various dynamics involved in an art classroom environment.

1. Did the art teachers experience an intense self-reflective experience?

2. Did the art students demonstrate the use of spatial sequencing memory through affective symmetry gauging?
3. Has the novel visuospatial and bodily kinetic curriculum improved the art students' ability to complete artworks?

Population and Sampling

This was a secondary data group (convenience sampling method) with the same characteristics of spatial sequencing memory as the general population. Spatial sequencing memory was the central variable of the sample, the statistic, because it can be shown to be the one factor that was similar to persons with Down syndrome and typically developing individuals. The findings were not generalizable to the population due to the non-random (non-probability) nature of the existing sample. There were three criteria for the art student participants in the original research (Ferg 2018).

1. All the participants had documented Trisomy 21.
2. All the participants had a record of their demographics with the school administration.
3. All the participants had published artworks in the JLDF art show catalogs or the JLDF book on the history of the art school (Ferg 2018).

Specifically, this was a purposeful sample because the choice of the participants was information-rich cases for the investigation of the relationship between the novel curriculum and the improvement of visuospatial sequencing memory (Patton 2002). This type of research is appropriate for a qualitative study.

Design

The qualitative research required fieldwork, which was the direct personal contact with the art teachers and students of JLDF. The three one-hour interviews with the art teachers were conducted after the end of the school day at 2:30 in the afternoon. The art teachers had requested to be interviewed together as they have spent 25 years co-teaching and developing the novel curriculum for the art students. The interviews were conducted as a general guided-interview format. The researcher had prepared an outline of issues and questions to be loosely followed during the interviews. This structure allowed for flexible and unexpected discovery during the interviews (Patton 2002). The researcher followed the four intentions Patton advised when conducting focus group interviews:

1. Acquire then and now information of the phenomenon.
2. Build the evidence of a previous event.
3. Estimation of future events.
4. Validate and coordinate the data from other sources (triangulation).

The interview questions for the art teachers followed a measure over time and focus group design. The questions were in a sequential order to help the art teachers reconstruct the events that occurred leading up to the creation and development of the novel curriculum. All of the questions were an open-ended version. The three interviews were considered more of a pilot study so the open-ended questions were appropriate and generated further information between the art teachers and interviewer (Patton 2002). The first interview established the context, the second, allowed the art teachers to reconstruct details of their experience and the

third, encouraged the art teachers to reflect on what the meaning of their experience was for them (Patton 2002).

Literature Review

A theoretical basis for the descriptive aspects of the construct of creativity can be found in the development of progressive education through pragmatism. John Dewey (1934) responded to the realistic lens of circumstances in life through a pragmatic philosophy. Dewey wrote that education was a natural process similar to the action of growth. He reasoned that the experiences students have involve an indeterminate struggle to explain a problem. When the student learns how to solve problems the situation becomes determinate and the intelligence of the student can then grow (Eisner 1994, 14). This experientially-based view of education is known as Progressive Education (Dewey 1934). Progressive education helps students understand themselves better in their own environment and community, which promotes the opportunity to learn about other societies.

The relationship between intelligence and creativity can be understood empirically (following Dewey) and this relationship has been a research goal of the behavioral psychologist, Howard Gardner. Gardner proposed that people have multiple intelligences (MI) and he referred to these as aptitudes (Gardner 1983). MI has influenced educators around the world to begin to develop curricula that addresses the interaction of the eight categories of aptitudes: linguistic, logical-mathematical, spatial, bodily kinetic, musical, interpersonal, intrapersonal, and naturalist (Gardner 1983; Armstrong 2009).

Qualitative Approaches for Lived Experiences

Eisner proposed the novel research approach, Connoisseurship and Criticism, for qualitative inquiry to specifically evaluate the interactions of teachers and students in the classroom environment. One aspect of this interaction has been how emotions relate to memory i.e. learning in the ongoing pedagogy of a classroom environment. Eisner stated that until the cortical process of how somatosensory messaging of emotional states is integrated into the current definition of intelligence (logical thinking) there will continue to be a lack of knowledge about the potentiality of human cognition (Eisner 1994). Therefore, this circumstance, stated Eisner, has to be considered a gap in student learning and national assessments (Eisner 1986, 1994, 2002). Eisner's investigative approach has been instrumental in furthering the epistemology of teacher and student classroom interactions.

Patton, a qualitative researcher and developer of the Evaluative Approach, paralleled the research method of Eisner in seeking, through qualitative measure, this optimal potential. Patton's Evaluative Theory described fundamental tenants in qualitative research, which provided the researcher with the main objectives for the planning and structure of using in-depth interviews to explore the meaning making an individual provides to a lived experience (Patton 2002; Lincoln 1995).

1. There are diverse methods in qualitative research.
2. Purposeful sampling increases the recognition that creativity is at the center of qualitative research.
3. There are information-rich cases that reveal the crucial interaction of focus groups, interviews and the researcher, which lead to revelatory qualitative findings.

4. The interviews lead to further disclosures by the researcher to monitor and report the participants own experiences.
5. The process is mirrored in the process of evaluation because a good interview opens feelings and experiences for the interviewee and is a process of self-reflection. This, then, is the making sense of (meaning making) that involves the human's sense of our relationship to the real world to continually rediscover ourselves (Patton 2002).

These tenets have been considered fundamental in qualitative research and provided the researcher with the framework for the study (Patton 2002; Lincoln 1995).

Creative Teaching

Education research on the subject of creative teaching follows numerous avenues of investigation. Simplicio has investigated the question of whether creativity may be innate for all teachers or limited to a few with a gifted ability. The author stated that creativity has been essential in the classroom and that further research is needed to develop a methodology to be able to show teachers how to change their perspectives and re-envision themselves (Simplicio 2000). An inherent human expression for creativity would be further revealed by professional development PDU for teachers (PDU). The phenomenon and the historical developmental process would be similar to the growth of the subjects of reading and mathematics.

A meta-analysis by Esquivel showed the positive correlations between increased creativity in the classroom and improved learning for students. According to the author, it has been crucial for teachers to be allowed to design a classroom environment that has encouraged creative tasks (Esquivel 1995). Looking more systematically, Rinkevich has proposed that there are three key points for understanding classroom creativity. First, studies should also report on

what were the roadblocks in the classroom for teachers to avoid. Second, that teachers who seem naturally gifted in creativity should be modeled for the design of a creative classroom, and third, educators should set up PDU experiences for teachers so that further research on better models of creativity can be undertaken (Rinkevich 2011).

Lapeniene and Bruneckiene in 2010 set up PDU for 261 teachers who concurrently participated in the workshop and completed pertinent surveys on creativity in the classroom. Three factors of individual level behaviors that the teachers stated were essential were determined from the self-selected responses. The best predictor of creativity in the classroom was teacher self-efficacy, a sense of earned competency involving emotions and cognition. Work related emotions and motivation sources were also important factors. The art teachers at JLDF also stated they had felt a new confidence in themselves after their self-reflective experiences, which gave them an authentic experience of self-efficacy.

These research project studies were supportive of the focus of this Capstone that teachers in the classroom can develop their creativity further by receiving instruction i.e., PDU on the subject of the inherent expression for creativity in the classroom due to an engaging environment and experiences of self-reflective activities to identify logical, spatial and aesthetics thinking. A teacher's personal re-envisioning of their own awareness via experiential work will provide them with increased self-efficacy for creative endeavors.

Teacher Self-Reflection

Judith Sowder, an education theorist, has studied the best practices of teacher development for teaching mathematics (Sowder 1998). She proposed that pedagogy, which encourages a teachers' ability to be self-reflective, has been important for understanding who

the students are as learners (Sowder 2007). Sowder along with Eisner stated that the teacher guides the environment of the classroom to engage student learning, “Curriculum changes cannot succeed, however, if teachers are not appropriately prepared” (Sowder 1998, 128).

bell hooks, a writer, teacher and education theorist, has written extensively on the importance of the freedom for students to be expressive and creative in the classroom, what she calls “the practice of freedom” (hooks 1994, 13). hooks stated that it is progressive education that is the best fit for holistic pedagogy. She further elucidated her implication, “That means that teachers must be actively involved committed to a process of self-actualization that promotes their own well-being if they are to teach in a manner that empowers students” (hooks 1994, 15). The search for a practical method of reinforcing the necessity of teacher self-reflection can be demonstrated when an instructor uses logical, spatial and aesthetics thinking to assist students to recognize the same in themselves. The neural process of self-reflection has also been investigated in the field of neuroaesthetics in the disciplines of the arts and education.

Study of Neuroaesthetics

Neuroaesthetics has been the investigation of the science underlying the concept of creativity and has followed numerous psychophysics theories. The research approaches of psychophysics behavioral measurement and case study were employed in this study to explain further the process of innovation. Cupchik (1995) has been investigating a manner in which to measure how memory interacts with the emotions generated by viewing artworks, a visuospatial and bodily kinetic aptitude. A focus group framework, of the purposeful sampling approach by Patton (2002) has been tangential to the research of Wang, Cant, and Cupchik

(2016). These neuroaesthetics behavioral psychologists have been investigating the relationship of the cortical processes of creativity and emotions in the making of artworks and how this may be connected to the use of memory. Eisner's insights in using the connoisseurship/criticism approach to analyze the description, interpretation and evaluation of an education classroom (Eisner 1994) and the investigations in neuroscience by Wang et al describe a bridge that connects to the artistic criteria Patton used to judge the "effectiveness of qualitative inquiry" (Patton 2002, 266). These various methodologies all converge on the construct of the personal experience of self-reflection, which can be used to identify logical, spatial and aesthetics thinking in order to engage with creative classroom curriculum.

The key to this cortical association has been the expectation of teachers and teacher administrators to engage in the thoughtful and feeling-based self -reflection of their own cognitive components in order to know their students and other teachers better. It is, as if, they were interviewees participating in a focus group. It has been the self-analysis of when a teacher is "taken through a directed reflective process [that] affects the persons being interviewed and leaves them knowing things about themselves that they did not know" (Patton 2002, 278). The underlying cognitive and emotional processes of the development of the self, include the conscious components of logical, spatial and aesthetics (Damasio and Carvalho 2013).

Damasio and Carvalho (2013) in a similar manner to Gardner studied the human brain in clinical cases of cognitive dysfunction. The methodology was to use the nMRI technology that shows *in vivo* the cortical processing of the connections of the mind and body. The authors have identified the multiplicity of the sensory messaging between the brain stem nuclei and the

neocortex furthering our understanding of the relationship of emotions, cognition and memory involved in various tasks.

In particular, for this investigation, it has been important to understand the relationship of self-awareness in the making of art to the role of memory. A crucial aspect of the cognitive processes required in the making of artworks is affective symmetry gauging (Ferg, 2018), which incorporates spatial sequencing memory (Yang, Connors, and Merrill 2014). Yang et al report that persons with Down syndrome have a typically developing ability as compared to the same age group of average students. This spatial ability has been a fundamental aspect in the self-reflective practice described by Eisner, Patton, and Cupchik.

Solution

Exploratory case study documents a phenomenon within its context. This research includes the art teachers' interviews and the direct and participant observations while making art in their art studio. The qualitative research approach is inductive. The primary focus of this secondary data collection has been the narratives of the art teachers' experiences and videos of the art students while making the art. The intended application of the purposeful sampling has been the selection of an information-rich case. The situation of the two Mexican art teachers has been studied in-depth in order to learn about their experiences of self-reflection and how this affected their ability to be creative teachers in the classroom, the issue of significance (Patton 2002).

Daniel and Alan graduated in 1994 from the Esmerelda Institute of Fine Art in Mexico City D.F. They had no prior art education training to teach persons with Down syndrome. The JLDF art students showed artistic promise in their early works so the Founder of JLDF, Professor

Sylvia García Escamilla, hired the two artists to create a fine arts program. After the first year, Daniel and Alan stated they were devastated but had to finally admit they could not teach the art students even the most simple art principles or ideas. They reached out to Professor Escamilla and her staff to get help in the situation. The art teachers revealed that they had gone through personal self-reflection as artists and teachers in order to understand that a change was needed within their own thinking about how artists should be and what they make should look like.

They said that the self-reflective process changed them and this was noticed by their families, friends and the art students. The art teachers stated that they developed a novel visuospatial curriculum after experiencing a reversal of their own understanding of logical, spatial and aesthetics awareness. This new awareness, then, allowed them to respond to the art students in a manner that provided a more successful outcome for the art students' awareness of their own cognitive and physical abilities in the making of art. Daniel and Alan said they were able to be more flexible in the personal art they made and with how they taught the students.

They stated that the emergence of the novel curriculum came about as a trial and error circumstance and was developed over time. The art teachers discussed the occurrence of what they called four generations of art students. By this they meant they recognized an improvement in the artistic abilities within each new group of students. In retrospect, Daniel and Alan stated that they know it is best to let yourself experiment and explore, to use different materials and methods in order to increase your creativity (See Appendix C).

The goal of systemic qualitative research design is to avoid researcher selection bias in interpreting data. The interviews with the art teachers were meant to gather information from the individuals directly involved and in their own work environment. There was no assumption of generalizability of the findings from the small number of participants. There was no predictive power of the conceptual model and no treatment for the participants.

The teachers' responses to the questions were recorded on video to achieve a high level of accuracy in the documentation. The art teachers provided the observational data from three interviews (following the evaluative process of interviews by Patton). However, it was important to validate this data by using the statistical measurement of inter-rater reliability (IRR) assessment. The definition of IRR is that the statistical tool is a way of quantifying the degree of argument between two or more individuals. Curriculum content experts provided the independent ratings about the unit of measure, visuospatial curriculum, in order to assess the similarity or difference from the collected data. This procedure followed classical test theory stating that observed scores (X) = True Score (T) + Measurement Error (E) (Gable and Wolf 1993).

The expert curriculum judges (two individuals) helped in assessing the art teachers' development of the novel design as a valid description of visuospatial curriculum. A fundamental characteristic of the assessment is whether the teaching approach demonstrated the use of spatial sequencing memory (Gable and Wolf 1993). The curriculum theorist experts were chosen based on their teaching and research knowledge of visuospatial and bodily kinetic content. A psychometric survey of the curriculum assessment was the between individual

comparisons of the scaling differences of the decisions of the experts (connoisseurs) (Eisner 1986) i.e. what constitutes visuospatial and bodily kinetic curriculum.

The assessment was an inter-rater reliability (IRR) questionnaire for the collection of secondary data via interviews and observations given during the research project in 2015. The purpose of the psychometric survey was to assess if the novel curriculum, shown by the art teachers and students through interviews and videos, was an example of visuospatial and bodily-kinetic curricula. The responses from the two curriculum specialists were conclusive, the IRR ratings comparing each of the experts' responses, and supported the claim that the art teachers had created a novel visuospatial and bodily kinetic curriculum. In addition, the responses of the specialists indicated that the art students had demonstrated the use of spatial sequencing memory through the action of affective symmetry gauging. The IRR is calculated using the Cohen's kappa statistic, which takes into account the number of choices that may have been made by chance, $\kappa = 0.8$ for the independent rating between the raters. This result indicates an excellent agreement between the two educators. The educators' IRR assessments added content validity to the research (See Appendix D).

There were limitations to the approach of the case study in terms of the generalizability of the statistical analysis. The IRR procedure was an appropriate analysis to counter balance researcher interpretation and provide increased validity of the psychometric measurement on the judges' assessments of the novel curriculum following classical test theory (Gable and Wolf 1993).

Discussion

There was a confound in the study design of the prior expectation of the art teachers that the art students would have been able to follow at least the very fundamental aspects of a fine arts curriculum. However, this was not the case and the teachers went through a dramatic emotional and cognitive journey to create a method that would teach the art students about making art via a novel visuospatial and bodily kinetic curriculum. The construct of reliability was supported by using direct interviews of the art teachers about their experiences with a professional translator as the art teachers spoke primarily Spanish. Content validity was whether or not the sources of collected data demonstrated a positive relationship of the novel curriculum to student learning and progress in the spatial sequencing memory of the art students. A triangulation of the data sources supported internal validity.

Ethics

The three principals of ethics required adherence to the respect for the person's autonomy, beneficence and justice. In this situation the art students are persons with Down syndrome and the John Langdon Down Foundation Founder, Professor Escamilla, is the legal guardian of the students. Therefore, it was Professor Escamilla's responsibly to read, understand and sign the Informed Consent Form for the students as she was the most informed individual in their lives to make the decision of participation. The two art teachers were also asked to sign the Informed Consent Form because they were interviewed about their novel curriculum.

The construct of beneficence explored the possible risks to the participants. The art students' identities were masked using a sequential numeric coding. This was in order to reduce

any criticism or embarrassment for the student. The primary reason to visit the school was because the teachers and art students were more comfortable in their own environment. There was no harm other than the possibility of mild psychological issues involved in the experience of the change in the daily routine for the participants for the teachers to demonstrate the curriculum.

The investigation included the suggested direct and long term benefits of the study for the participants. A direct benefit for the art students was the increased exposure of their artworks in the public. Since a portion of the school's revenue is based on the sales of prints of the artworks the school also benefited with greater public interest. The effects of the focus on the development of the novel curriculum by the art teachers may influence them to document their processes. This may lead to a publication of their findings of how to teach art students who are challenged with disabilities. There is a strong likihood that there would be immediate and long term benefits for the participants.

The question of who would benefit from the knowledge of the visuospatial and bodily kinetic curriculum comprises anyone who uses affective symmetry gauging, and subsequently, spatial sequencing memory. The findings of expanding how people learn relates to the global community. The design of the study follows the ethics of social science investigations as presented in the Belmont Report. The manner of risks involved was minimal.

Recommendations

The two art teachers were the primary sample because it was their lived experience of reversing the traditional methods of art instruction to develop a curriculum whereby the students could learn the fundamentals of the artistic process. This was a limited sample and

the findings cannot be generalized to a wider population. Yet, this study has the potential to encourage further investigations, which could be replicated in other schools, where teachers may have an interest in visuospatial and bodily kinetic connections to literacy, the sciences and mathematics content areas. Replication of the study findings may support PDU for teachers and teacher administrators for all levels, P-20, to assist them in understanding how creativity connects content areas in education. The proposal is not limited to any one education system and can be employed at the international level.

Conclusion

This research uses the qualitative evaluative approach of in-depth interviews to discover the manner in which the two art teachers created the novel visuospatial and bodily kinetic curriculum (Patton 2002). The art teachers at JLDF did not have a professional background to teach students with Down syndrome. Originally, the art teachers assumed the students would understand at least something about artistic principles and descriptions. The teachers had a bias about how the students learn. They stated they had to change their own thinking through self-reflection. This is a non-parametric data source as the approach was subject to researcher bias in the interpretation of the art teachers' narratives yet every attempt was made to use the exact words and inflection of the art teachers' statements.

Significance

Future studies in education may be the setting up of schools as prototypes for the development of curricula by teachers and teacher administrators to increase the awareness of teaching creativity in the classroom in the global education community. Rinkevich (2011) suggested conferences for teaching creativity in the classroom should be organized to provide

PDU on the subject. The proposed project would be an opportunity to collect the necessary data to develop a psychological self-efficacy behavioral model and assessment that demonstrates the cortical connections of logical, spatial and aesthetics thinking facilitated by affective symmetry gauging and spatial sequencing memory. A creativity assessment would add authenticity to the requirement for creative teacher pedagogy in the classroom.

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Appendix A

Glossary of Terms

Aesthetics ability: observation of a pleasing appearance or effect (*Merriam-Webster.com).*

Affective symmetry gauging: the pleasing emotional perception of the geometrics of the division in extreme and mean ratio and the root 2 rectangle with a division of three to the implied vortex forms and symmetry relationships (HR-RT) while using proportional gauging (Ferg 2011, 2018), a pleasing auditory response (Helmholtz 1895; Huntley 1970); the ability to perceive artistic principles of HR-RT, which induce a positive response, in the making and viewing of artworks using proportional gauging (Bouleau 1963; Baxandall 1988).

Aptitude: a natural ability; capacity for learning (*Merriam-Webster.com).*

Authenticity: being realistic or genuine (*Merriam-Webster.com)*

Bodily kinetic ability: ability to control one's body movements and to handle objects skillfully (Gardner 1983).

Creativity: To grow; the use of imagination or ideation (Dewey 1934).

Creativity assessment: the measurement of being creative (*Merriam-Webster.com).*

Division in extreme and mean ratio (DEMR): a straight line is said to have been cut in extreme and mean ratio when, as the whole line is to the greater segment, so is the greater to the less (Fechner 1865).

Evaluative Approach: the planning and structure of using in-depth interviews to explore the meaning making an individual provides to a lived experience (Patton 2002).

Ideation: The formation of ideas or concepts: imagination; to think original thoughts (Lubinski 2003).

Inherent creative expression: natural ability for inventiveness and capacity for learning (*Merriam-Webster.com).*

Inter-rater reliability (IRR): the statistical tool is a way of quantifying the degree of argument between two or more individuals (*Merriam-Webster.com).*

Logical ability: analytical or deductive (*Merriam-Webster.com).*

Multiple Intelligences Theory (MI): human beings possess not just a single intelligence (often called "g" for general intelligence). Rather, as a species human beings are better described as having a set of relatively autonomous intelligences. Most writing about intelligences focuses on a combination of linguistic, logical, spatial, bodily-kinetic, musical, interpersonal, intrapersonal, and naturalistic intelligences. Individuals differ for both genetic and experiential reasons in terms of their profile of intellectual strengths and weaknesses. No intelligence is in and of itself artistic or non-artistic; rather several intelligences can be put to aesthetic ends, if individuals so desire. There can be no direct educational implications from this psychological theory; but if individuals differ in their intellectual profiles, it makes sense to take this fact into account in our educational system (Gardner 2003, 1).

Proportional gauging: The act of perceiving both internally and externally, by the sensory messaging of movement through space, the relational aspects of objects, items, or sets of things (Baxandall 1988; Bouleau 1963).

Spatial sequencing memory: is the memory for the order of spatial information that has been presented in temporally sequential order (Yang et al. 2014).

Self-efficacy: the power to build one's self- confidence (*Merriam-Webster.com).*

Self-reflection: Concentration of the mind on one's self (*Merriam-Webster.com*).

Teaching creativity in the classroom: how to be creative taught as a formal education subject to students (Eisner 1994).

Visuospatial ability: to perceive the visual spatial world accurately and to perform transformations upon those perceptions. Sensitivity to color, line, shape, form, space and the relationships that exit between these elements. Includes the capacity to visualize, or graphically represent visual or spatial ideas, and to orient oneself appropriately in a spatial matrix (Armstrong 2009).

Appendix B

Examples of Creative Curriculum

Armstrong, Thomas. 2009. *Multiple intelligences in the classroom*, 3rd ed. Alexandria, VA: Association for Supervision and Curriculum Development:

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Appendix C

Questions for the art teacher interviews:

1. What was your formal artistic training? Completed the Arts Program at the Esmeralda Institute of the Arts in Mexico City D. F. in 1994.
2. Why were you hired at JLDF in 1994? Hired to set up a fine arts program.
3. What training did you have to teach students with Down syndrome? No prior training to teach the JLDF art students, who were persons with Down syndrome.
4. What changed the focus of the art school to include a traditional fine arts curriculum? The JDF art students showed artistic promise in their works.
5. What did you do when you realized you were not able to teach the students even the basics of art? We were completely devastated and embarrassed. We felt ashamed and had to tell Professor Escamilla.
6. How did the JLDF staff and Professor Sylvia help you to determine a course of action? At that time, it was thought that the students had an ability with visual spatial learning. So we, the staff and Professor Escamilla decided to plan a curriculum around that method.
7. What personal experiences occurred for you during this time? We had struggled with changing our thinking about how art should be taught, we had to change ourselves. We thought a lot about what we would do. For example, the students could not understand the terms horizontal and vertical. One day when I (Daniel) was talking with the students about these terms, Alan got up on a table behind me. When I said horizontal he laid down on the table, when I said vertical he stood up on the table. The students began to understand when we used a visual or sensory experience.
8. How did the process of self-reflection change your interactions with the students? It changed how we interacted with the students and how we looked at their art. We were more open to thinking differently about what art is. We realized that when we let go of being too structured then we became happier with our art and enjoy the process like the students do. They told us we are now Down.
9. How did this process of self-reflection change your interactions with your family and friends? Yes, this changes our relationships with our family and friends very much. They even told us that we seemed different. We became calmer and were less likely to get upset or anxious.
10. By what process did you develop the new curriculum, which is based on teaching the JLDF art students? It was by trial and error. We tired many things and the curriculum you see now is what has developed over time. We think we are on our fourth generation of students. We say that because we can see the difference in the groups and how they are learning. We have a better idea of how to teach them now. We give them lots of sources for ideas in their paintings and let them work through the process of creating the composition and color until they complete the work.
11. What specific improvement in their spatial sequencing memory have you observed in the students while they are making their artworks? The newer groups of students seem to learn

more quickly from our classes how to set up and plan out their ideas. They are less confused and can learn where to find the materials.

12. What suggestions do you have for other educators in developing their own self –reflective pedagogy as teachers? Try different ideas or different mediums. Let yourself experience and explore to make different kinds of art. This will help you get more ideas.

Appendix D

Instruction: Please read through the answers that were given by the art teachers (originally in Spanish and translated) during the multiple interviews. There will be three videos to watch that include the information about the novel curriculum, student artworks and teacher interviews. The aptitude of visuospatial ability involves the cognitive ability to identify, analyze and mentally manipulate objects. Visuospatial curriculum consists of two categories, spatial relations and spatial visualization. After viewing the videos please read the following survey questions and choose an answer by circling what you think is the most appropriate answer. The responses you will give are based on a Likert scale, not demonstrated, slightly demonstrated, not applicable, demonstrated, highly demonstrated.

1. Did the art teachers include the following aspects of visuospatial curriculum?

   A. Visually identify objects …

      not demonstrated, slightly demonstrated, not applicable, demonstrated, highly demonstrated.

   B. Analyze relationships between objects …

      Not demonstrated, slightly demonstrated, not applicable, demonstrated, highly demonstrated.

   C. Mentally rotate objects …

      Not demonstrated, slightly demonstrated, not applicable, demonstrated, highly demonstrated.

2. The experiences that a student has while in a classroom follow a specific set of educational goals, a curriculum (Dewey 1934; Tyler 1949).

A. Did the art teachers demonstrate a systemic series of activities which were experienced by the students?

   Not demonstrated, slightly demonstrated, not applicable, demonstrated, highly demonstrated.

B. Were these experiences clearly arts education?

   Not demonstrated, slightly demonstrated, not applicable, demonstrated, highly demonstrated.

C. Did the students demonstrate both visuospatial and bodily-kinetic abilities?

   Not demonstrated, slightly demonstrated, not applicable, demonstrated, highly demonstrated.

3. For traditional fine arts, art instructors in accredited schools present the following concepts, which to be learned by the students.

   Did you see the teachers explain their use?

   A. Visual image arrangement …

      Not demonstrated, slightly demonstrated, not applicable, demonstrated, highly demonstrated.

   B. Use of materials …

      Not demonstrated, slightly demonstrated, not applicable, demonstrated, highly demonstrated.

C. Use of proportional gauging to alter ratios of images, which is spatial sequencing memory.

Not demonstrated, slightly demonstrated, not applicable, demonstrated, highly demonstrated.

4. In the accomplishment of the art students' use of the artistic methods demonstrated by the art teachers, it is necessary to complete the art works.

A. Did the art students complete the art works?

Not demonstrated, slightly demonstrated, not applicable, demonstrated, highly demonstrated.

Results of the IRR assessment per rater:

Answers to the questions by the higher education art educator Susan Koenig. Ms. Koenig holds a Master's degree in Fine Arts from the University of Texas, San Antonio, with a Concentration of painting and drawing. Susan also has a Bachelor of Arts Degree from the University of Pittsburgh, Pittsburgh Pennsylvania with a concentration in Pre Med and Fine Art. Susan has taught studio art courses as an adjunct professor for 20 years in many colleges and universities in Denver and Texas.

1. A. highly demonstrated, seen in one event B. highly demonstrated C. not available
2. A. highly demonstrated B. highly demonstrated C. highly demonstrated
3. A. demonstrated; through the results (artworks). B. demonstrated C. highly demonstrated; the reference and art piece shown together
4. A. highly demonstrated

Answers to questions by the P-6 art & literacy educator Dr. Daria Stowell. Dr. Stowell has a PhD in Education, curriculum and instruction, from the University of Denver. She also has a Master' in Social Work from the University of Michigan. She has taught grades P-6 with a focus on creativity and literacy for 15 years.

1. A. highly demonstrated B. highly demonstrated C. demonstrated
2. A. highly demonstrated B. highly demonstrated C. highly demonstrated
3. A. demonstrated; but gave the students freedom to do what they imagined. B. highly demonstrated; however, students were given the opportunity to choose their materials C. highly demonstrated; they were given the sequence from smallest to medium to largest size.

4. A. highly demonstrated

Calculation of Kappa as a Measure of Concordance in Categorical Rating
The inter-rater reliability (IRR) assessment to determine (agree, disagree) did the art teachers develop a visuospatial curriculum.

Number of categories = 2
Basis for weighting: imputed relative distances between ordinal categories, successive ordinal categories

Data entry: Case 1: 9/agree; 1/disagree
Case 2: 9/agree; 1/disagree

9	1	10
1	9	10
10	10	18

Kappa with Quadratic Weighting: Observed Kappa: 0.8; Standard Error: 0.1342
Confidence Intervals: 0.95% of Observed- Lower Limit: 0.537
Upper Limit: 1

Proportions of Agreement: Maximum Possible: 1; Composite: 1
Chance Expected: 0.3333; Composite: 0.5
Observed: 0.8182; Composite: 0.9
Confidence Intervals: 0.95% of Observed-
Lower Limit: 0.4776/0.9679; Composite: 0.6687
Upper Limit: 0.9679/0.9679; Composite: 0.9825

Frequencies of Agreement: Maximum Possible: 10/10; Composite: 20
Chance Expected: 5/5; Composite: 10
Observed: 9/9; Composite: 18