Title: The Legacy of Gonzalez Rey's Concept of Subjectivity Continues to Inform and Inspire: A Study of Imagination in STEM and Imagination in Play

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Abstract: The study reported in this paper was concerned with how imagination in play and imagination in STEM create conditions for preschool children's development. Drawing on cultural-historical concepts, notably Fernando Gonzelez Rey's concept of subjectivity, the study examined how children experienced contradiction during moments of play and learning in a common PlayWorld. Affectively charged dramatic moments appeared to support collective play and STEM engagement, thus leading to the proposition that affect and intellect act in unity during the process of imagining. The individual-collective dialectic of imagining concepts within collective play situations became the basis of the subjectively configured exchanges that created the dynamic conditions for children's development who became increasingly oriented to learning within imaginary situations.

The genesis of cultural development as proposed by Vygotsky (1987) suggests that every function in the cultural development of the child appears on the stage twice. Always on two planes, where the 'social' and then the 'psychological' are expressed initially between people interpsychologically and then by the individual intrapsychologically. But to study this in motion and in unity needs powerful concepts. In line with Vygotsky, Fernando Gonzalez Rey further theorised how concepts can act in unity when studying the process of human development. Inspired by the historical foundations of cultural-historical theory, where both the early works and later conceptualisation of Vygotsky's writing were brought to bear on contemporary problems, he introduced a new conception of subjectivity that has given new directions for researchers. Central here is how Gonzalez Rey's concept of subjectivity does not

constrain itself to an individual phenomenon, but rather the symbolic emotional character of dynamic exchanges become foregrounded in research and their study is captured as the constant configuring and re-configuring of symbolic processes. This conception of subjectivity informed the central problem of this paper: How imagination in play and imagination in STEM learning are collectively realised in preschool settings as conditions for children's development. This brief report is devoted to how the concept of subjectivity as conceptualised by Gonzalez Rey was used to realise new thinking in the study of imagination.

Study overview

In line with Vygotsky's (1971) writing on catharsis in the Psychology of Art, where emotionally dynamic moments find their resolution, it is proposed that through the dramatization of stories in preschool settings and the re-creation of the dramatic events in a range of forms (including digitally animated movies), that children can experience emotionally charged events (dramatic story) which could lead to an emotional self and other awareness within these imaginary situations, which in turn may lead to being oriented towards the learning of STEM concepts in order to resolve the dynamic tensions experienced. To study these imaginary situations and subjective configurations within preschool settings, children were introduced to the story of Alice in Wonderland, and over a period of 7.1 weeks, children and their teachers re-created the story in their preschool through a Conceptual PlayWorld (Fleer, 2017) inspired by Lindqvist (1995).

In line with an educational experiment as proposed by Hedegaard (2008), where a collaboration between researchers and participants of the study is featured, professional development on PlayWorlds and STEM concepts related to chosen story, and ongoing weekly support by the research assistant, were provided to the teachers throughout the research period.

In an educational experiment Hedegaard (2008) has argued that a cooperation between

researchers and teachers exists, where the subject matter perspective and a personal motive perspective is featured. A cultural-historical conception is to frame this intervention through professional development and ongoing dialogue, and the "intervention is planned in relation to a theoretical system and not simply from agendas of practice" (p 185). This is in keeping with Gonzalez Rey (2007), because it goes beyond the individual and the conception of individual categories (see below).

Participants

Two degree qualified and experienced teachers planned and implemented the PlayWorld of Alice in Wonderland by Lewis Carroll. A total of 18 children (3.0-5.8, mean age of 4.8) consented to be involved in the study. The children were all of European heritage backgrounds and lived in a middle-class community.

Data collection

A total of 153.3 hours digital video observations of the playworld using 2 cameras was captured when children and teachers when in the imaginary situations. A total of 1,725 digital photographs were taken. A total of 32.5 hours of teacher interviews were gathered as part of the weekly planning session which formed the educational experiment.

Data analysis

The focus of the analysis of the digital data was centered on the concept of subjectivity. This concept, as discussed by Gonzalez Rey, acted as a meta-frame to support the dynamic of capturing in motion the subjective configurations of the children, teachers and material conditions of the preschool setting.

The dynamics were studied initially through the dialectical concepts of emotional

expressions (raw expression) and feeling states as expressed through language (e.g. fear) – what is the dramatic tensions? As introduced by Bozhovich (1977), one of Gonzalez Rey's inspirational scholars, "elementary emotions undergo a qualitative change and are transformed into complicated, specifically human feelings: moral, aesthetic, intellectual, etc." (p. 19). This is quite a different reading to how emotions are usually presented in the literature. The other analysis focused on the dialectical relations between imaginary play and learning of concepts as part of the periodisation of the preschool child to play and the school child to learn, as discussed by Vygotsky – crisis of the age periods. Here the collective-individual imaginings as symbolic processes were foregrounded within this dynamic.

Findings

The findings cluster around three areas. First the data show that the preschool children who participated in this study could not be studied as individuals or as part of a fragmented taxonomy of categories. Rather, contradictions appeared to collectively orient children to imagining STEM solutions which appeared to be a part of their collective imaginary play and their new motive orientation towards learning. But these actions and imaginings were not static reproduction of the story plot. Instead, their actions had to be seen as dynamic productions of subjective senses conceived as dynamic subjective configurations in the context of their imaginary play of Alice in Wonderland (see Table 1 summarises examples of the results and practices).

Second, in the Alice in Wonderland PlayWorld children's imagining in STEM and in play had to be conceptualised dynamically as part of an iterative set of imagined practices. The children appeared to begin with explorations of what it means to be tiny, followed by collective explorations of tiny things in their world. The children learned about Alice, went with their teachers down the Rabbit hole following White Rabbit, visited the Mad Hatter, built their own

props with blocks, received a letter from White Rabbit who was lost in Microbe Land, looked

for microscopic things, made maps to help White Rabbit, prepared a digital animation of their

story, and presented their digital story at a movie night. These are presented in Table 1.

Table 1

Examples of data

Examples	Examples	Contradictions
Emotional expressions (raw expression) • Being tiny (children show with fingers what this looks like in relation to self) • Whole body response to being small in big world • Being worms	Feeling states as expressed through language (e.g. fear) • How it feels to be tiny (book is read) • Explore outdoors for 'tiny things' • Use iPads to photograph insects • Collect specimens • Worm farm	Dramatic tension– what is the dramatic tensions? Children feel small, but there are microscopic things smaller than they are.
Imaginary play • Shrinking and going down the rabbit hole • Looking for the white rabbit	Learning of concepts • Magnification • Microbes in compost, worm farm, etc.,	Semiotic oppositions and contradictions – crisis of the age periods • Playing shrinking and learning about magnification and microbes in the soil
Individual imaginings as symbolic processes • Building a rabbit hole with blocks and tunnel • Making 'drink me potion' and shrinking • Looking for White Rabbit	Collective imaginings • Mad Hatter party • Looking for the White Rabbit who is lost • Looking at the microbes in Microbe Land when in Alice in Wonderland PlayWorld • Making maps to help White Rabbit	Paradoxical situation and magical metamorphoses – what was foregrounded within this dynamic • Collectively imagining in the Alice in Wonderland PlayWorld – shrinking, making maps, looking for White Rabbit who is not real. • Teachers – real relations as a teacher but also a character in the PlayWorld

Third, the findings show that the teacher's role was central for creating emotionally charged

situations and problem formulations, that the children needed to solve. The subjective configurations in Table 1 can be conceptualised as:

- Dramatic tension

- Semiotic oppositions and contradictions

- Paradoxical situation and magical metamorphoses

Dramatic tensions were deliberately created to go beyond the storyline. The letter asking for help—I am lost in Microbe Land—created a dramatic tension that appeared to energise the children into wanting to help the lost White Rabbit. But to do this, the children needed to explore concepts of shrinking and microscopic organisms—imagining things they could not see with their eyes.

A storyline developed *semiotic oppositions* (e.g. near and far, external and internal, etc.,) *and contradictions* (Alice shouldn't go down the rabbit hole but she does). The main character (White Rabbit) crosses the boundary between real and everyday world to an imagined story world. The children ask about if something is real or pretend, such as, "Is that you Oliva (teacher) or are you the White Rabbit?"; "I have an idea, we can make a map for the White Rabbit"; "Where is Microbe Land?"

Paradoxical situations arise and *magic* becomes instrumental in the plot of the dramatic story. On the journey, the main character encounters problems, but with magic is helped along – drink me potion for shrinking to go down the rabbit hole. In the story reading, the children hear about the shrinking potion, so they can go down the rabbit hole, but also the teachers extend the imaginings to science; this open up semiotic oppositions and contradiction because children read the letter from the White Rabbit and ask, "How could he write a BIG message if we drank all that 'Drink Me, Drink Me Potion'?"

Conclusion

In studying the dialectical relations between imagination in play and imagination in STEM, it was found that a dynamic tension between the fiction of the storyline and the real world of science concepts supported children's development in 3 ways.

First, through the concept of subjectivity as outlined by Fernando Gonzalez Rey across many publications (González Rey, Mitjáns Martinez & Goulart, 2018), it was found that the subjectivity of the children could only be understood collectively. That is, we see development "as the subjective sense and symbolic production that articulate the different social spaces in their subjective dimension" of the PlayWorld of Alice in Wonderland, and in the preschool practice context of "configuring a new systemic condition of social organisation" (Gonzalez Rey, 2007, p. 10). The Alice in Wonderland PlayWorld is a collective imagining and children's participation is both real and imagined. In this social organisation children are not static beings imagining devoid of the social context in which they are engaged. Their development cannot be studied and reported within individual silos. The children's subjectivity in this reading must be conceptualised as both individual and collective at the same time. This gives a deeper reading of the relations between the interpsychological and intrapsychological concepts first proposed by Vygotsky.

Second, imagination in play by its very wording implies a social dynamic that is both realised in action and in thinking with others (whether present or remembered), and is by its nature negotiated and directed through a social dynamic. In this study, the new practices of the Alice in Wonderland PlayWorld could be better understood through the "new representation of the psyche…new understandings of processes and structures traditionally…analysed without being related to comprehension of the psyche as a whole" which goes beyond a "fragmented taxonomy of categories embodied in individuals" (Gonzalez Rey, 2007, p. 3). Imagination conceptualised in this way leads researchers towards studying the configurations and re-configurations of symbolic processes within social contexts rather than examining one

isolated function of a human being.

Finally, imagination in play like imagination in STEM, is conceptualised by Vygotsky (1966) as a person changing the meaning of the visual field (what they see) to give it a new sense (imagining it to be something else). Subjective sense foregrounds the system of senses that come together when children jointly play in the imaginary situation of Alice in Wonderland PlayWorld. How children with a different sense of the same imaginary situation play together, can be better understood through the concept of subjective senses, and subjective configurations—deliberately plural in a Gonzalez Rey reading. Teachers introduce into the PlayWorld STEM concepts that supported the collective imaging of the children. The storybook with its narrative, helped the children be in the same imaginary situation together, and the problem situations that arose, such as a letter arriving from the White Rabbit, broadened the collective circle of joint imagining that was physically acted out. These collective imaginings embodied through actions in joint play, created new conditions that were emotionally charged and were constantly re-configured. The study identified dramatic tension, semiotic oppositions and contradictions, and paradoxical situation and magical metamorphoses.

Fernando Gozalez Rey took seriously the study of both individual and social subjectivities as dynamically interwoven (Gonzalez Rey, 2017) and as such, contributed to understanding cultural practices, as socially enacted and historically located human productions. We have much to treasure from his theoretical legacy, but also the important empirical work he undertook to advance his own concepts. A researcher who advances theory **and** practice in unity, is a true scholar of cultural-historical theory.

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