Representations and fractional knowledge education essay

This survey provides an scrutiny of fractional cognition demonstrated by 25 (7th and 9th class) pupils from a suburban bunch of schools in a suburban community in Georgia. Students were given five fraction jobs necessitating them use representations for their replies. Analysis of single responses indicated that pupils at both class degrees lack a complete apprehension of fractional constructs such as portion to whole, fractional parts, and distances and relationships between measures.

Research suggests that larning is more meaningful when pupils are given frequent chances to interact with different theoretical accounts and rethink the constructs (Dienes, cited in Post & A ; Reys, 1979) . Harmonizing to Lesh, Landau, & A ; Hamilton (1983) , mathematics constructs can and should be represented other ways as good, utilizing real-world objects, spoken symbols, written words, and written symbols. They suggest that pupils who use a assortment of ways to stand for fractions develop more flexible impressions of fractions. Petit, Laird, & A ; Marsden (2010) province utilizing theoretical accounts and on a regular basis inquiring pupils to explicate their thought plays an of import function in direction. Asking pupils inquiries as they work through job resolution helps them construct upon their apprehension of fractions. Heller, Post, Behr, & A ; Lesh (1990) , found that about merely one fifth of 7th graders and one 4th of 8th graders have a functional apprehension of proportionality.

Models should pervade direction leting pupils chances to job solve and develop apprehension of fractional constructs such as portion to whole, fractional parts, and distances and relationships between measures. Students demonstrate more trouble happening the fractional portion when the figure of parts in the whole is equal to the magnitude of the denominator instead than a multiple or factor of the magnitude of the whole (Bezuk & A ; Bieck, 1993) . Three types of theoretical accounts pupils use to interact with, work out jobs, and generalise constructs related to fractions are country theoretical accounts, set theoretical accounts, and figure lines. Student-drawn country theoretical accounts can be effectual for doing comparings of parts of wholes or turn uping fractions on a figure line. Circle theoretical accounts can be used efficaciously to compare fractions if pupils consider the size of the whole and are accurate in their dividers into equal-sized parts. Uniting theoretical accounts with manipulatives can assist pupils concentrate on of import characteristics of the theoretical accounts and do comparings (Petit, Laird, & A ; Marsden, 2010) .

Georgia Performance Standards

In the first class pupils are expected to split up to 100 objects into equal parts utilizing words, images, or diagrams (G1M1N4) . Specifically halves and fourths as equal parts of a whole utilizing images and theoretical accounts (G1M1N4C) . In the 2nd class pupils are expected to understand and compare fractions (G2M2N4) . Students will pattern, place, label, and compare fractions (tierces, sixths, eighths, ten percents) as a representation of equal parts of a whole or of a set (G2M2N4) . In the fifth class are expected to compare fractions and warrant the comparing (G5M5N4F) .

Harmonizing to the Georgia Department of Education, pupils begin to develop an apprehension of fractions in the 3rd class. Students are able to see fractions in general as being built out of unit fractions, and they use fractions along with ocular fraction theoretical accounts to stand for parts of a whole. Students are able to utilize fractions to stand for Numberss equal to, less than, and greater than one and work out jobs that involve comparing fractions by utilizing ocular fraction theoretical accounts and schemes.

Students develop apprehension of fraction equality and operations with fractions in the 4th class. They extend old apprehensions about how fractions are built from unit fractions, composing fractions from unit fractions, break uping fractions into unit fractions, and utilizing the significance of fractions and the significance of generation to multiply a fraction by a whole figure.

Students begin widening apprehension of fraction equality and ordination by utilizing ocular fraction theoretical accounts in the 5th class. In add-on, pupils are expected to compare fractions with different numerators and denominators, understand add-on and minus of fractions as connection and dividing parts mentioning to the same whole, apply and extend old apprehensions of generation to multiply a fraction by a whole figure, and understand denary notation for fractions, and compare denary fractions.

Research Questions

In this survey, the undermentioned inquiries were posed:

How good make seventh and 9th class pupils perform on fraction jobs that require them to utilize representations?

Are there any important differences by class degree?

Do pupils at the 7th and 9th class degree demonstrate an apprehension of fractional cognition?

Method

Participants

Students from a suburban bunch of schools in a suburban community South of tube Atlanta participated in this survey. In this bunch of schools, the pupils from three simple schools, feed into two in-between schools, both in-between schools feed into one high school. The population of the high school, similar to the population of the feeder schools has a pupil population that is about 1 % Asian-Pacific Islander, 3 % Hispanic, 50 % African American, and 46 % Caucasic. For the 2009-2010 school twelvemonth, both simple and in-between schools met equal annually advancement (AYP) . The high school did non run into AYP.

This survey included pupils in the 7th and 9th class. Teachers were solicited who had a professional relationship with the research workers. The categories represented included regular mathematics for pupils in the 7th class and Mathematicss 1 for pupils in the 9th class. See Table 1 for pupil demographics. Of the two instructors that submitted responses, 14 7th class and eleven 9th grade appraisals were submitted. For the intents of this survey, responses from all 25 will be included in the commentary. Images of alone and questionable responses will be provided to back up and document the pupil work that depicts effectual direction and acquisition or whether pedagogues and other stakeholders need to focus/alter direction to advance pupil larning & A ; apprehension.

The Instrument

A computational fraction trial was developed and adapted from an EasyCBM, 6th class investigation and was administered to all participants. The trial assesses fractional cognition accomplishments and consisted of 5 points necessitating pupils to utilize representations for their replies. The appraisal was designed to place their ability to utilize representations, theoretical accounts, or incarnations of rational figure measures to reply a assortment of inquiries (Petit, Laird, Marsden, 2010) . The appraisal focused on four key schemes or theoretical accounts pupils must be competent in utilizing when working with fractions or rational figure measures: models/picture based images, symbolic representations of fractions (in fractional signifier) , unwritten & A ; written communicating or fractional measures, and utilizing real-world objects in context (Petit, Laird, Marsden, 2010) . The first inquiry asks a inquiry for pupils to find the greater of two fractional measures - use of theoretical accounts or any representation is non expected. The figure line represents the measure or spectrum of values between 0 and 1. The figure line is divided into four equal sections without the values of each section labeled. The 2nd inquiry seeks to find if pupils are able to use a figure line to turn out their response to the first inquiry. The 3rd inquiry gives pupils a opportunity to utilize country theoretical account to place three-fifths of a 5-by-5 grid. The 4th inquiry is a circle where pupils are expected to place five-sixths of the country in the circle. The 5th inquiry is a set of 36 stars, real-world objects, where pupils are expected to place one-quarter of the entire figure of stars. The 6th inquiry is two rectangular boxes that pupils are expected to utilize (as in measuring) to find which measure is greater two-fifths or three-eighths.

Execution

The appraisal was administered during category for pupils in both categories on the same twenty-four hours. Participants in the 7th class were given the appraisal as a warm-up activity. Participants in the 9th class were given the appraisal after finishing a trial. In both categories, pupils were allowed 20 proceedingss to finish the five inquiries. During the appraisal, pupils were read the waies if requested, separately. Hints, hints, suggestions, and solutions were non provided.

Analysis

The research inquiries were analyzed by hiting the trials as correct, wrong, or non attempted. Each point was separately reviewed and compared with the other participant 's responses every bit good. The responses were analyzed to find how pupils represent fractions and job solve. In add-on, analysis focused on pupil apprehension of fractional cognition.

Question one needed pupils to find the greater of two fractions (See Figure 1) . Consequences indicated 23 correct responses, one non response, and an wrong response. The pupil that did non react was in the 7th class. The pupil that provided the wrong response was in the 9th class.

In inquiry two, pupils were asked to come close the location of two fractions on a figure line (See Figure 2) . Four pupils were able to come close the location of the measures of and right, 16 were inaccurate, and five pupils provided no response for the inquiry. Surprising, there were four responses from pupils in both classs that resembled the theoretical account created in Figure 1. Figure 3 is an illustration of a right theoretical account of the two fractional or rational measures. Responses similar to that found in Figure 2 and 4 rise concerns in the analysis of pupils ' apprehension of comparing rational figure measures utilizing a figure line because of the assignment of values that differ from conventional regulations of numeracy. Problem two in Figure 1 and 2 demonstrates that the pupil is utilizing whole figure logical thinking and puting the fractions on the figure line harmonizing to the magnitude of the denominators (Petit, Laird, & A ; Marsden, 2010) .

Figure 1

Figure 2

number1a. gif

number1c. gif

The image in Figure A was found on the answer sheet of a 9th class pupil.

The image in Figure B was found on the answer sheet of a 9th class pupil.

Figure 3

Figure 4

number1b. gif

number1d. gif

The image in Figure A was found on the answer sheet of a 7th class pupil.

The image in Figure A was found on the answer sheet of a 9th class pupil.

For inquiry three, pupils were required to stand for portion of a whole utilizing a grid. Nineteen responses were right, two pupils did non react, and five pupil responses were inaccurate. Of the two pupils that did non react, one pupil was in the 7th class, another pupil was in the 9th class. Students in both classs provided an wrong representation of the part of the grid (See Figure 3) . The inquiries that were correct all involve pupils shadowing in 15 of the 25 entire squares or boxes on the 5-by-5 grid. One of the right responses, Figure 5, shows how the pupil rationalizes the colouring of 15 boxes.

Figure 5

Figure 6

The image in Figure 5 was found on the answer sheet of a 7th class pupil.

The image in Figure 6 was found on the answer sheet of a 9th class pupil.

Question four required pupils to stand for 5/6 utilizing a circle theoretical account. Two responses were right in stand foring 6 apparently congruous subdivisions of the circle (See Figure 7) . All other pupils were non able to either pull the subdivisions of equal size or approximated the shaded, five-sixths, of the circle. One of the right responses was from a 7th grade pupil ; the other right response came from a 9th class pupil. Some of the more interesting responses or frequent mistakes noticed are provided in the tabular array below. Figure 7 shows that the 7th grader can come close the value of five-sixths, but is non able to demo the ground exact or approximative country confidently as seen in Figure 8. Figure 9 is really near to an accurate word picture of the country, nevertheless, the subdivisions of the circle are non tantamount - there are four eighths and two fourths shown. Figure 10 is from the same pupil who provided rational in Figure 6 ; nevertheless, the pupil makes the premise that the units of the circle as drawn similar to a grid are the same size.

Figure 7

Figure 8

question5a. gif

question5b. gif

The image in Figure 7 was found on the answer sheet of a 7th class pupil.

The image in Figure 8 was found on the answer sheet of a 9th class pupil.

Figure 9

Figure 10

question5c. jpg

question5d. gif

The image in Figure 9 was found on the answer sheet of a 7th class pupil.

The image in Figure 10 was found on the answer sheet of a 9th class pupil.

Students were asked to place A? of the entire objects represented in inquiry 5. Twenty-three pupils provided the right response and two were wrong. Although there were different methods used by the pupils who identified the 4th of all 36 stars, every pupil identified nine as being the 4th utilizing real-world objects or touchable points. Of the two pupils that scored falsely on the job, one circled all of the objects and the other circled merely five.

Question 6 measured whether pupils were able to right find if 2/5 is greater than 3/8 utilizing bars. There were five right responses and 14 wrong responses, showing pupils are unable to stand for the different rational figure measures as shaded parts of a set of equal sized subdivisions. Six responses were clean. Of the five responses that were right, three were from pupils in the 7th class, two were from 9th graders. Figure 11 shows that the pupil understood to partition the rectangles into parts determined by the denominator of both fractions, but were unable to make equal sized-partitions, an mistake identified by Petit, Laird, Marsden (2010) . Figure 12 seems to demo the same error, nevertheless, there is non a clear cut response as to which measure the pupil thinks is greater. Figure 13 represents a right response with an appropriate theoretical account of turn outing the pupils concluding and principle.

Figure 11

Figure 12

question6a. gif

question6e. gif

The image in Figure 11 was found on the answer sheet of a 9th class pupil.

The image in Figure 12 was found on the answer sheet of a 9th class pupil.

Figure 13

Figure 14

question6c. gif

question6d. gif

The image in Figure 13 was found on the answer sheet of a 7th class pupil.

The image in Figure 14 was found on the answer sheet of a 7th class pupil.

Discussion

Consequences demonstrated that pupils have trouble stand foring fractions at the 7th and 9th class degree. Students demonstrated trouble with relative believing throughout many of the undertakings. While some pupils were able to successfully put the fractions on the figure line in consecutive order, they were non relative. This was besides apparent when pupils used the country theoretical accounts to find which fraction was greater and when they were asked to shadow a fractional portion of the circle theoretical account. Harmonizing to Petit, Laird, & A ; Marsden (2010) , inaccuracy of theoretical accounts can be the consequence of holding an uncomplete cognition about the importance of wholes being the same when compared to fractions.

Consequences did non bespeak a distinguishable difference in fractional job work outing utilizing representations between 7th and 9th graders. Most 7th and 9th class pupils are able to utilize representations when work outing fractions. However, consequences indicate that some pupils demonstrate a deficiency of apprehension of fractional cognition. This is peculiarly concerning, given that pupils begin working on fractions in the first class and should get down to develop an apprehension of fractions in the 3rd class. Students who are unable to utilize fractions to stand for Numberss equal to, less than, and greater than one and work out jobs that involve comparing fractions by utilizing ocular fraction theoretical accounts and schemes lack a conceptual apprehension of fractions that will go on to impede their mathematical abilities as they are introduced to more complex math accomplishments.