

# **"Mathematics" and "Maths" - The Same Meaning?: Investigating One Young Child's Beliefs**

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This paper discusses beliefs of one young learner of mathematics about the meaning of the terms "mathematics" and "maths". The latter term is generally considered to be a common abbreviation of the former but with the same meaning. Data collected from one child demonstrate that for her the meanings of the two terms are different. Use of a range of interview procedures has facilitated the child's articulation of her beliefs and the accessing of them by the researcher.

Major curriculum materials in the discipline of mathematics (e. g. Australian Education Council, 1991; Board of Studies, 1995; Lovitt & Clarke, 1988) most commonly use the formal term "mathematics", whereas in everyday speech the abbreviation, "maths" is commonly substituted. The familiarity of the latter term and the acceptability of the exchange of the two terms, are illustrated, for example, in a newspaper article (Hunting, 1995) in which the title and the summary statement, designed to catch the attention of readers and inform as to the main message of the article, use the term "maths", whereas the text which talks about children's learning deploys the term "mathematics".

"Maths" is a recognised abbreviation of "mathematics" (Wilkes & Krebs, 1982), with an assumption of the same meaning. However, the present research shows that young children may not hold an understanding of this relationship between the two terms. This finding is of significance to teachers and others in the education community as it reminds that children, even at the young age of eight or nine years, are individuals who construct their own meanings which should be acknowledged. By giving attention to children as individuals an educator can come to know the children better and can respond appropriately to them by taking their beliefs into account. The research illustrates that one should not assume the meanings children hold, but should take a stance of "listening" to individual students. This listening may occur through verbal, written and pictorial communication modes.

## **The Focus of This Paper**

The research reported in this paper is taken from a larger study which includes an investigation of young children's beliefs about mathematics. Eight children, of eight to nine years, were interviewed on ten occasions over a five month period. The interview data were analysed thematically (van Manen, 1990), beginning with the use of the qualitative data handling computer program NUD•IST (Non-numerical Unstructured Data Indexing Searching and Theorizing) (Richards & Richards, 1990), to organise data into manageable categories and to record index trees for each child. One theme, not originally planned as an issue for analysis, but having emerged from the data, is the meanings expressed by some children for the term "mathematics", as distinct from "maths". This paper explores this theme or issue from the perspective of the beliefs of one child, Cara, as expressed in her interview data. Differences in meaning were found for some other research participants also, but are not explored in this paper. The discussion includes consideration of Cara's meanings for "maths", the term she was more familiar with, but gives emphasis to her understandings of the term "mathematics", as it is the difference in meaning between the two terms and her idiosyncratic beliefs about "mathematics" that were unexpected. The value of the data collection approach and the possible impact of the approach on the articulation of the children's beliefs are discussed also in the paper.

## Background

Cara was chosen by her teacher as a low-achieving grade three female research participant. She was interviewed on ten occasions over a two term period, for about thirty minutes each time. Data were collected through a range of means, for example: written responses using sentence starters or a focused question; verbal responses expressing such things as reactions to photographs, video clips, and children's drawings; pictorial responses through drawing; and semi-structured discussion.

In the main research study, of which this paper reports on an element, a key research question was: "What meaning do children give to "learning" and "mathematics"?. The intention was to access and analyse children's constructs for these terms, partly as background to the remainder of the study. It was within this section of the study that the theme or issue of different meanings for the terms "mathematics" and "maths" arose. Each of the children had constructed their own idiosyncratic understandings, some believing the terms had the same meanings and some believing they were different. Cara was one of the children for whom the construction of different understandings for the terms became evident.

The discussion below attempts to portray Cara's understandings as one example of the findings of the study, to illustrate that terms interchanged unreflectively by adults are not necessarily understood in the same way by a young child, and to illustrate that a young child's meaning for a particular construct can be complex, requiring multiple instances of data collection and careful analysis to gain more than superficial insights.

## Findings

The research was begun with the intention to use the words "mathematics" and "maths" interchangeably. As the researcher and interviewer, I soon learnt this to be naivety on my part, a naivety not precluded by results from trailing of research procedures, nor by reports I had read of previous research. Thus the findings which I detail below were not only unexpected but showed me early on the value of intensive interviewing in seeking the young child's perspectives. I begin with a discussion of Cara's meaning for "maths", the term with which she was more familiar and seemingly more comfortable.

### *Cara's Meaning for "Maths"*

In contrast to her beliefs about "mathematics", as discussed below, Cara seemed to be confident in responding to tasks where she was asked questions which sought her understanding of the nature of "maths" and maths activity. It seems that her responses regarding "maths", rather than those regarding "mathematics", should be compared to those from previous research which discuss children's understandings of mathematics.

It seems common for children to associate number or computation with mathematics (Frank, 1988; Garafolo, 1989; Spangler, 1992; Stodolsky, Salk, & Glaessner, 1991). Cotton (1993) reported from his study with 5 to 9 year old children that "the older children saw mathematics as nothing more than number" (p. 15).

The third interview with Cara provided results which contrast in part with these findings from previous research. In response to two word association type activities Cara related the words measuring and estimating to "maths". These spontaneous responses suggest that these processes were perhaps the aspects of maths of which Cara was most conscious, or with which she was most familiar. Cara also referred many times in interviews to measuring and estimating in relation to activities in school, home, and work contexts. Later in her third interview Cara added other aspects when defining maths. In response to a word wheel asking "What is maths?", Cara gave an expanded view of maths. Cara read from her writing on the wordwheel:

Measuring, estimating, playing with things, guessing things, using things, doing things, games, learning things like maths

At times Cara gave different responses. For example, when asked what she would tell an alien maths was, thus being asked virtually to define maths, she listed: estimating, times tables, dividing by, equals and half millions. The conversation continued, with the interviewer asking if there was anything else she would tell the alien so that he would have a good idea what maths was. The only things mentioned were pluses, takeaways, and Applied Maths, which Cara thought was something to do with halving. This response gave precedence to number concepts thus showing contrast with the other examples cited.

The above examples, although given in brief, suggest a lack of consistency in Cara's beliefs, or, perhaps more accurately, multiple aspects within her beliefs. Cara demonstrated that she saw maths as physical activity through responses such as measuring, playing with things, and using things, as cognitive activity through responses such as estimating, and guessing, and as content as expressed in responses such as times tables, pluses, and equals. It is clear that these responses contrast in part with the findings from previous research.

Cara appeared confident in giving the responses discussed above. The same confidence did not appear when she was asked about "mathematics", as is demonstrated below. Interview excerpts are referred to in an attempt to seek insights into Cara's meaning for the term "mathematics". The possible impact of the interviewer upon the construction of meaning by the child is discussed also.

### *Cara's Meaning for "Mathematics"*

In my first interview with Cara, I asked her to draw a situation in which she felt she was learning mathematics well. In response she said: "I don't know anything about mathematics". However, she said she did know what maths was and went ahead to complete the task.

From this point, which was the beginning of the first interview I conducted, I was aware of the possibility of children having differing meanings for the terms "mathematics" and "maths". The second interview provided an opportunity for validation of Cara's first interview response.

When reflecting on Cara's response in her second interview to the task of drawing a person doing some sort of mathematical activity I became truly alerted to the possibility and complexity of differing understandings.

Interviewer: Okay Cara, the first thing I'd like you to think about is, or what I'd like you to do for me, is I want you to draw a person doing some sort of mathematical activity

Cara: Mathematics?

I: Yeah

C: On sports we done mathematics we done, you had to have a partner that was just a tiny bit taller than you and you have to go on their back and go around the wicket and back around and back

I: Mhm

C: And you had to, you know the way you do a pyramid

I: Mhm

C: You had to do that just with two people like one person down the bottom and one person on top

I: Right, so what sort of mathematics were you doing there?

C: Er prac, getting warm up for gymnastics

I: For gymnastics. And you said you were doing maths there at that time?

C: No it wasn't maths, it was seeing if we could do things without falling

At this stage of the interview I was not alert to the significance of Cara's first reference to "mathematics", that is, of her taking on the meaning for the word "gymnastics" when I said "mathematics". I did not recognise her subtle shift. As the interview progressed a difference in her meaning for the terms "mathematics" and "maths" began to become more apparent:

- I: Right, so I said can you think of, can you draw someone doing some sort of maths activity  
 C: Maths  
 I: Maths activity. What did you think I said?  
 C: Mathematics  
 I: What's the difference between mathematics and maths?  
 C: Mathematics can do, er you, I don't know  
 I: What is mathematics?  
 C: I don't know

My lack of full awareness of the possibility of miscommunication resulted in unconscious continued interchange of the terms "mathematics" and "maths". Cara's response caused me some confusion which it appears was conveyed to Cara. My confusion, combined with a sensed lack of acknowledgment of her view, seemed to cause Cara to change what she was saying. Cara's following statement suggests that she received from my responses the message that "maths" and "mathematics" are the same and that she responded by adjusting her story to show an understanding of this:

- I: Well why did you choose that activity when you were doing pyramids and things when I said to think of someone doing some mathematics activity?  
 C: W.e.l.l er I thought you meant um . . . measuring

At the end of the conversation regarding the gymnastics activity I asked Cara: "So was that maths?". She answered: "Er, well it was really sports". So Cara was fairly sure that she hadn't been doing "maths" in that situation but she was not certain as to whether she had been doing "mathematics", as she was not sure of the meaning of the term. From the vividness of this discussion regarding gymnastics I, as the interviewer, took on an understanding that Cara had associated the words "mathematics" and "gymnastics" rather than "mathematics" and "maths". In addition, I was alerted to the possibility of differing understandings and perspectives of the terms "mathematics" and "maths" among the eight children.

In response to this incident I added to my planned procedures a simple task through which I could directly address the issue of children's meanings for "mathematics". In her response to the sentence starter "I think mathematics is .....", given in her eighth interview, Cara showed that she had begun to form a meaning for the term "mathematics". Cara responded to this task by writing her first response but then the exchange became verbal.

- C: I think mathematics is great  
 I: Why did you say that?  
 C: 'Cos sometimes you can get it right, sometimes you can get it wrong (giggle)  
 I: Alright. And what do you mean, sometimes you can get it right?  
 C: Like when, what is mathematics? Like if you do something wrong you don't get a tick and if you do something right you get a tick

Cara's second statement indicates that she may have been seeing "mathematics" and "maths" as the same thing. However, by asking herself the question "What is mathematics?" Cara suggests that she remained unsure of the meaning of "mathematics", that she was questioning her own understanding of this concept.

- I: Did you just say what is mathematics? Is that the question?  
 C: Yeah  
 I: Well what would your answer to that question be? What do you think it is?  
 C: Err, learning things, er doing things,  
 I: Mm  
 C: About maths

Once again Cara associated "mathematics" and "maths", suggesting not only that they are the same but that they are an active process, made up of learning and doing. Cara continued by giving examples which reinforce this notion of action:

- I: What sort of things?  
 C: Like, um, um, umm, like, like you don't know what dividing by is and you learn how to do it. And um it's like learning how to swim, learning how, how width the pool is and how long it is  
 I: Mhm. Is that mathematics is it?  
 C: Yeah that's what I think  
 I: So how's that different from maths?  
 C: Width and length is mathematics I think  
 I: Is it also maths?  
 C: Well, yeah  
 I: Is maths the same as mathematics or is maths different from mathematics?  
 C: I think maths, maths is different, maths is different from mathematics  
 I: Can you explain that difference to me?  
 C: Um,  
 I: I'm pretty interested in this, so I sort of want to know what you think  
 C: I think that maths is different from mathematics because mathematics is doing something else than maths. Maths is like times tables, and well sometimes you can learn things from maths but I think mathematics might be good to learn

In this segment of the conversation Cara began by giving examples of activities which suggested that she saw "mathematics" and "maths" as the same. However, when asked directly whether they were the same or different she stated that she thought they were different. This change of view suggests some possible confusion or uncertainty. The last statement by the interviewer suggests also that Cara was tiring of, or beginning to have some difficulty with, the conversation, perhaps aware of her own uncertainty and therefore finding the probing frustrating. This is endorsed by Cara's following statement in which she begins by saying she doesn't know what "mathematics" is:

- I: Can you still tell me a bit more about what mathematics is? It's good to learn  
 C: I don't know what mathematics is, I think it's something that you learn and then you can do and then you can like learn it when you grow up, more  
 I: So is it more when you're grown up that you learn mathematics is it, and children at school learn maths?  
 C: No, children at school learn mathematics and when you grow up to be in that school I think you learn more mathematics  
 I: The school across the road? [Reference made to the secondary college]  
 C: Yeah  
 I: So you're still, you are learning mathematics now are you?  
 C: Yes, I think  
 I: You think so?  
 C: No we're learning maths  
 I: Oh you're learning maths  
 C: We've only done mathematics once

- I: Alright, when did you do that? Tell me about the once you did it  
 C: Ages ago. Term three  
 I: Tell me about it  
 C: We were in with Miss T and we were doing a worksheet and then she was telling us a bit about mathematics and I forget what she said [Miss T, a specialist teacher, taught the class the measurement section of the mathematics curriculum]  
 I: Alright. So it was just that once with Miss T was it that you did mathematics?  
 C: (Non-verbal: Yes)  
 I: Right. So you don't usually do mathematics at this school?  
 C: No I don't do it anywhere

Cara again stated that she did not know what mathematics was, but thought it was something you learn and then do and then learn more. She was unsure as to the timing of this, suggesting that "mathematics" is mostly learnt in the secondary school. She believed that at primary school she learned "maths" but because of one experience which the teacher may have called "mathematics", she thought she had learnt "mathematics" at one time. The conversation moved on to consider the use of "mathematics" by adults and continued to explore Cara's understanding of the relationship between "mathematics" and "maths":

- I: Do you think adults use mathematics at all?  
 C: Yeah, when they're measuring  
 I: Like your dad?  
 C: No, when they go shopping and they're measuring how heavy is a ton of bananas or about three or four bananas and they're doing that, I think that's mathematics  
 I: Is that also maths?  
 C: Yes  
 I: And that's mathematics too?  
 C: Mhm  
 I: In your classroom if you did some weighing would you be doing mathematics or maths?  
 C: Maths  
 I: Not mathematics?  
 C: Yep

In the above excerpt, Cara's tendency to associate "mathematics" with people older than herself is apparent again. She indicated during the interview that she saw "mathematics" either as something you learn as student in the upper primary grades or at the secondary level, or as an activity done by adults when measuring as part of shopping. For these people and activities she equated the terms "mathematics" and "maths" but generally did not do so in relation to her own experiences in the classroom.

The interview continued with an attempt to have Cara draw together what she had said through this whole interview segment:

- I: Now is there anything else that you can write on here for me as well as I think mathematics is great?  
 C: Uh uh (No)  
 I: What else could you write after we've had this discussion? What would you write there? I think mathematics is . . .  
 C: (No response)  
 I: Don't know?  
 C: Mm mm (No)

This limited response from Cara suggests that the beliefs she had been expressing in the interview were at the formation stage. Cara's beliefs may have been in the process of construction and thus were open to fluctuation, uncertainty, or even contradiction, as illustrated in the quotations. In this eighth interview Cara attempted to communicate her ideas on what mathematics is, but lacked definition and certainty. Some of her statements appear to hold contradiction; for example, we see that she swayed between "mathematics" being "maths" and it not. However, we see also her attempts to make sense of what she observed, for example by suggesting that as "mathematics" is learned mostly in secondary school, it is used or done by adults rather than by children.

In this eighth interview Cara gave a sense that for her "mathematics" was a verb, rather than a noun, that when she thought of "mathematics" she thought mainly of action rather than of content. This was endorsed by Cara in a brief conversation at the end of her tenth and final interview:

- I: What did you say you thought mathematics was?  
 C: Learning maths  
 I: You thought it was the same did you?  
 C: Yes. Just learning maths

During the interview I indicated that I thought Cara meant that "mathematics" and "maths" were the same, but in retrospect I believe that she may have been seeing "mathematics" as the "learning" and "doing", that is, the activity within the domain of "maths". This reinforces two statements she made in the eighth interview when she said: "(Mathematics is) err, learning things, er doing things" and that adults use mathematics when they are "measuring things".

### Summary and Conclusion

It was found that a young child does not necessarily assume the same meaning for the terms "mathematics" and "maths", thus challenging the often unreflective exchange and assumption of common understanding of the equivalence of these terms by adults. The research provides insight into the value of reflecting on, and being conscious of, the use of the terms, especially with young children. It demonstrates also the value of the use of a broad range of procedures in accessing children's beliefs as the meanings children have constructed may be complex with subtle differences in meaning between apparent synonyms.

The data from one child, Cara, demonstrated that beliefs about the nature of "maths" may encompass a broad spectrum of concepts or areas, and do not necessarily focus on number. This element of the research was presented in summary form in this paper, for the purpose of providing background and context to the discussion of Cara's understandings of the term "mathematics". These understandings of the meaning of the term "mathematics" were less easy to access due to Cara's uncertainty seemingly due to construction of meaning continuing to occur during the time of the research. It appeared that she may have seen "mathematics" as the activity element of "maths" but it cannot be concluded with certainty that this statement represents her belief. When Cara responded to the tasks investigating her meanings of the two terms, one noticeable difference was her level of confidence in responding. She appeared much more familiar, comfortable, and confident with the term "maths" than with the term "mathematics". However, when responding in regard to either term her responses were not always consistent.

It may be that Cara's apparent uncertainty in beliefs about mathematics was due to an evolution of her beliefs during the time of the two-term interview period. Cara's attempts at sense-making seem to have occurred throughout the interviews suggesting that the interviews themselves may have formed part of the process of Cara coming to construct her views.

The data presented illustrate that on any one occasion a child may not give the same response as on another occasion, thus suggesting a broad view, an unstable view, or



perhaps one in the process of construction. Changes in response also, for example, may be influenced by the way in which a response is elicited, recent experiences or feelings towards different elements of "maths", the holding of only partially formed views, or the making of an unconscious or conscious choice to mention only selected elements on any one occasion. As discussed above, the response of the interviewer, even if unintentionally influential, also may cause children to alter or redirect what they are saying.

The interview excerpts cited above show the power of the semi-structured one-to-one interview for allowing views and issues to arise, to become illuminated slowly, and possibly to develop further within the time of the interview. The research validates the use of a broad range of procedures combined with multiple occasion one-to-one interviewing.

The research highlighted also that a young child of eight or nine years may have developed individual and idiosyncratic views about the meanings of "mathematics" and "maths". Accessing views through means such as those discussed in this paper allows the teacher or other interested person to "listen" to the child's personal perspective, to come know the child better as an individual, and to be better informed when catering for the child in a mathematics class.

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