

THE ROLE OF AFFECT IN THE RESEARCH ON AFFECT: THE CASE OF ‘ATTITUDE’

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***Abstract.** This communication suggests that one of the motives for the theoretical confusion found in the research on affect is the researchers’ lack of explicitness regarding some fundamental choices, both specific and epistemological: these choices are linked to the researcher’s values and beliefs. The case of research on attitude is presented as an example.*

1. Introduction

In the field of affect, many researchers underline the necessity of theoretical reflection, and in particular, of clarifying the meaning of the terms used and improving not just the various constructs but also the relationships between them (Hart, 1989; Pajares, 1992; McLeod, 1992). Fennema (1989) observed that ‘[t]here was lack of definition, lack of clarity, and lack of connection to mathematics’ (p. 209). To avoid making the same mistakes again she underlined the opportunity that ‘new researchers on affect will be clear about what is being studied, precise in definition, and respectful of what has been learned previously.’ But it is not easy to respect ‘what has been learned previously’ when studies are not sufficiently explicit regarding the theoretical choices that have been made: when this happens, it is difficult to recognise which results are comparable, and we can sometimes end up with the perception that some are contradictory.

A typical case is the relationship between achievement / attitude, a central problem in attitude research. This connection is far from being clear, since studies in this field have sometimes obtained opposite results. One way to organise the results of various studies into a coherent account is *meta-analysis* (Cohen & Manion, 1994): Ma & Kishor (1997) performed such analysis investigating the relationship between attitude and achievement in a sample of 113 studies. But according to us, the problem associated with recognising ‘what has been learned previously’ cannot be solved by meta-analysis. The diversity of the results may be due to radically different choices, and the difficulty in orientating oneself in the midst of different results can be due to the fact that the preliminary assumptions were not made explicit enough:

“Because research questions, goals, and underlying assumptions are usually learned implicitly when people are socialized into a profession, they can be difficult even for insider to explain and compare. (...) As long as discussion between researchers trained in different traditions take place only at the level of methods, however, little communication is possible because the questions, goals, and assumptions that

constitute methodological choices are not made explicit.” (M.A.Eisenhart, 1988, p.102)

These assumptions are highly personal, and are linked to the researcher's values and beliefs (Mason 1994; Schoenfeld, 2002).

In this communication we will try to connect these two points of view: the necessity of a theoretical organisation in the field of affect, and in particular, the necessity of a theory for constructs such as emotions, beliefs and attitudes, and the requirement that the researcher makes explicit his choices (first of all to himself). On this point we would like to propose a theory: that the insufficient theoretical organisation denounced by many researchers in the field of affect research is in part due to a lack of clarity regarding some crucial choices. This lack clearly regards the communication phase, leading to a resulting difficulty in co-ordinating results emerging from different studies, but may also be found within a single study: to be specific, the beliefs that often remain implicit and of which the researcher himself is not always aware, may lead to choices that are in contradiction with each other.

This is almost a paradoxical theory: it implies that the research on affect, which is based on the recognition of the role that factors such as beliefs and emotions have on the decisional processes of both student and teacher, are limited by the very lack of recognition of affect's role on the researcher's decisional processes.

To elaborate this point of view, we are going to look at research on attitude, which within the field of affect is the area that we know best, and in particular we'll look at the central problem of the relationship between attitude and achievement. We will highlight some important choices which are normally not made explicit, and this analysis will provide us with the opportunity of highlighting some general problems. Overall, we will focus more on formulating questions than supplying answers, with the intention of fuelling a debate on these ideas.

2. The problematic relationship between attitude and achievement: the role of the researcher's implicit choices.

Within the field of affect, research on attitude has probably the longest history, but also the most ambiguous theoretical framework. According to many researchers (Kulm, 1980; Leder, 1985; McLeod, 1992; Ruffell et al., 1998), one of the reasons that has hindered the development of an adequate theory is the fact that most studies have concentrated on the creation of measurement instruments (as has also been the case in social psychology, where the construct was born), rather than on the development of a theoretical base.

In our previous works (Di Martino & Zan, 2001a, 2001b, 2002) we suggested that a first important step for the development of a theory is a thorough analysis of the 'attitude' construct: first of all this analysis requires a definition of the term itself. In

the variety of definitions of attitude toward mathematics used in the different studies, we identified two important types:

1. Following a ‘simple’ definition, attitude toward mathematics is just a positive or negative emotional disposition toward mathematics (McLeod, 1992).
2. Following a ‘multidimensional’ definition, attitude toward mathematics has three components: the emotional response to mathematics (which, however, has a positive or negative value), the beliefs regarding mathematics and the behaviour toward mathematics (Ruffell et al., 1998).

The acceptance of either definition, whether explicit or implicit, has consequences on the choice of assessment / measurement instruments to be used. Vice versa, only once the definitions have been stated can we evaluate the coherence of the assessment/ measurement instruments used.

Therefore, the definition of attitude is a first important choice. But in reality this choice not only isn’t made explicitly: often it is not made at all, and the assessment / measurement instruments used by the researcher implicitly end up in a continuous oscillation between various definitions within a single study.

It is interesting to re-read an old paper by Neale (1969) on this subject: it highlights not only this ambiguity between several definitions, but also the role played in this ambiguity by some of the researcher’s own beliefs, or, rather, by the fact that the researcher ignores his own beliefs. Neale introduces his study by speaking explicitly of *‘a belief that something called "attitude" plays a crucial role in learning mathematics’* (p.631). More specifically, he refers to the two different beliefs held by both mathematicians and educators regarding the attitude towards mathematics: *‘First, certain attitudes toward or beliefs about mathematics are thought to be important objectives of instruction. Second, positive attitude toward mathematics is thought to play an important role in causing students to learn mathematics.’* (Neale, 1969, p.631)

According to us, an accurate reading of this work allows the identification of some key points to understand the *current* research on attitude. It is clear in this introduction that there is ambivalence in the use of the word ‘attitude’, an ambivalence that remains, however, the characteristic of the research in this field, and which is testified by the instruments used in most research to assess / measure attitude.

Neale clearly distinguishes between two aspects, independent a priori one from the other, even if, for different reasons, they can both be considered as objectives of mathematical education:

- the first is linked to the epistemology of the discipline,
- the second to the emotional disposition towards it.

The link between these two issues with mathematical ‘learning’ is also different: in the first case, we can assume the construction of a certain vision of mathematics as a

constituent element of learning, in the second case, we can formulate the research hypothesis that a positive/negative emotional disposition is one of the various factors that influence the choice of involving ourselves in mathematical activity. If there is a link, and if so what is the relationship between the first and second issue, i.e. amongst the beliefs or vision that a student has of mathematics and the fact as to whether he likes the subject, is another research problem. But Neale uses the same word to describe these two situations, both of them significant, but different a priori. The choice of a single construct to describe the two a priori independent phenomena is a crucial choice, even if it does not appear a particularly conscious one. According to us, this choice assumes a series of important steps, in which the researcher's belief that the two phenomena are linked plays a fundamental role: the importance is assumed of not only a positive emotional disposition towards mathematics, *but also* of the vision of mathematics with respect to this disposition.

This ambiguity between attitude intended as emotional disposition and intended as vision of mathematics is present in almost all research on attitude, and has insinuated itself in all the measurement instruments used. The measurement of attitude in mathematics is done almost exclusively through the use of self-report scales, generally Likert scales, intended to assess factors such as liking / disliking, usefulness, confidence. Several items are constructed for each factor. But the most generally used items (for example: 'Mathematics is useful') deal with assessment of beliefs, taking for granted the fact that the agreement with such beliefs guarantees a positive emotional disposition.

The belief that emotional and cognitive aspects deeply interact, and are therefore important in the mathematics learning process, is in fact the driving force behind research on affect. In the field of attitude, this belief can push the researcher into providing a definition of attitude, which takes into account these two dimensions. Such a definition has been recently proposed by Daskalogianni & Simpson (2000), and modified by ourselves (Di Martino & Zan, 2002). We called it a 'bidimensional' definition, since behaviour doesn't appear as an explicit component: attitude is the pattern of beliefs and emotions regarding a certain subject.

The choice of a bidimensional definition of attitude as a 'working definition' (Daskalogianni & Simpson, 2000) reflects the researcher's awareness of the belief that it is important to take into account both the emotional and the cognitive dimension. But the unconsciousness of such belief can provoke a continuous sliding between what the researcher has assumed and what he/she desires as result of the research.

But there is another important point which implies other choices to be made by the researcher: the use of the adjective 'positive' referred to attitudes.

This use, common in most studies on attitude, derives from other choices which are generally ignored, and this silence is another motive for ambiguity.

If attitude is intended merely as emotional disposition, we can think of it as positive / negative. But the notion of attitude, intended as including beliefs, can not, *at least a priori*, be reduced to the positive / negative dichotomy. Talking about ‘positive’ attitude takes us back to other choices (which are also generally implicit and maybe often unconscious):

- a) the adjective ‘positive’ refers only to the emotional component of attitude (this is clearly the case when attitude is seen only as an emotional disposition);
- b) ‘positive’ is used as ‘that results in a positive effect’, in this way implicitly assuming a correlation with behaviour;
- c) ‘positive’ is referred to the cognitive component of attitude, i.e. beliefs, which are considered ‘positive’ in that they are shared by experts (or more often, in that the researcher *believes* that they are shared!)

The differences in the use of the adjective ‘positive’ imply not only different choices of assessment / measurement instruments, but even a different formulation of the research problem to be dealt with. For example, the problem of identifying how to push a ‘positive attitude’, typically encountered in this field of research, requires a completely different approach depending on whether the positive attitude refers only to the emotional component or it refers to a particular pattern of beliefs and emotions, to be assumed as a model.

This last observation introduces another point regarding attitude research, which can cause theoretical confusion in this field, and contradictory results in studies on the relationship between attitude / achievement: this is the shift from *learning* to *achievement*, a choice which causes many others to be made relating to how to measure achievement. This shift, once more, is evident in Neale’s work: ‘*Second, positive attitude toward mathematics is thought to play an important role in causing students to learn mathematics. The purpose of this paper is to explore these two beliefs, concentrating particularly on the second – the role of positive attitude toward mathematics in mathematics achievement.*’ (Neale, 1969, p.631). The passage from learning to achievement involves the inheritance of all problems related to assessment: from *what* to evaluate, to *how* to evaluate. This deals with huge problems (s. Niss, 1993) that involve important choices: it is enough to think of the difference between using tests which contain complex tasks like application and problem solving, and tests which consist of conceptual and procedural distinctions, sometimes containing multiple choice questions. Of course, this problem does not only concern research on attitude but also most research studies in mathematics education.

3. Epistemological choices

In the previous points we highlighted some important choices made by the researcher relating to the construct of attitude:

- the choices linked to the definition of attitude;
- the choices that lie below the use of the adjective ‘positive’;
- the choices relating to assessing / measuring learning.

The importance of these choices lies in the implications that these have on other decisions: not only those relating to the choice of method, or the interpretation of results, but also those relating to the formulation of the research problem (as we have already observed when we mentioned the possibility of accepting the adjective ‘positive’), and even to its choice.

The typical problems related with attitude in math. ed¹. gain a significance which depends on the choices made regarding the definition of attitude, positive attitude, and achievement: each case brings up different research problems. The scarce consciousness on the part of the researcher regarding these choices that are not generally made explicit, has many implications: the difficulty in co-ordinating results from different research studies, the apparent contradiction in results from different studies, or even the incoherence found within a single research study.

If the choices that we have analysed make specific reference to research on attitude, the consequences mentioned can obviously be generalised to other fields of research.

But another type of generalisation can be made by considering the causes rather than the consequences of these choices. For example, we can ask ourselves: what is the choice of attitude definition influenced by? What criteria does the researcher use to make this choice? And specifically: is the definition chosen according to the problem the researcher is interested in? This means that depending on the problem to be dealt with, the researcher may end up using different definitions. This is for example the suggestion of Kulm (1980), who claims: *'It is probably not possible to offer a definition of attitude toward mathematics that would be suitable for all situations, and even if one were agreed on, it would probably be too general to be useful'* [p. 358]. A different choice consists of considering the definition independent of the problem. In this case, once the definition is chosen, it will guide the problems and not vice versa.

¹ For instance: What is the relationship between achievement and attitude (if there is such a relationship)? How does attitude toward mathematics evolve during a subject's school experience? How can we explain the ‘spoiling’ of attitude toward mathematics from elementary school to high school? Which are the variables that influence attitude toward mathematics? Which variables are controllable? Is it possible to modify a subject's attitude toward mathematics? How?

But more generally: is it that the problems guide the choice of constructs, and more specifically, the process of borrowing them from other disciplines? Or do the constructs bring with them the traditions of the research from the field they were created in, and therefore impose the type of problem that can be reasonably dealt with?

This is an epistemological type of decision that our discipline has to make, linked to the relationship with other disciplines, and has important consequences in all fields: a decision that recalls the one between seeing mathematics education as a problem-led or a method-led discipline (see Bishop, 1992; Zan, 1999; Schoenfeld, 2002). In the field of the first research on attitude for example, mathematical education seems to have borrowed both the social psychology's construct and the research traditions linked to it, shifting the emphasis towards the measuring instruments rather than on the construct's theoretical organisation. But these research traditions are linked to the problems that social psychology intended to confront with this construct (s. Eagly & Chaiken, 1998): in particular, the emphasis on measurement aspects is linked to the typical problem found in this field, of predicting behaviour in situations related to choices. This problem is not as significant in mathematical education, where the analysis of a subject's decisional processes in problem situations are of more interest than the prediction of the choices made. We can therefore say that the construct inherited from social psychology rather than adapting itself to the problems presented in mathematics education, limits the type of problems that it can tackle.

Apart from the consciousness of having made specific choices highlighted in the examples we have given for attitude, it is thus also important to be conscious of, as well as to make explicit the fundamental epistemological choices made, the ones that characterise the relationship between research problems and constructs / methods used in mathematical education.

But we think that another epistemological choice appears particularly relevant and significant: the dichotomy between the paradigms of normative (positivist) and interpretive research.

We will again use the field of attitude as an example. In many works on attitude (see Neale, 1969; Leder, 1985; Ma & Kishor, 1997) the idea of attitude emerges as a characteristic of a subject, that *causes* certain behaviour. Again this position is not explicit, but can be inferred from the language used, methods used and also from the choice and formulation of the research problem. A different approach is to see attitude as a researcher's construct, with the goal of *understanding* the subject's behaviour (Ruffell et al., 1998).

We think that these choices lead us respectively to a positivist and an interpretive type of paradigm. The consequences of this choice on research are crucial (see Cohen & Manion, 1994): but in our opinion, as researchers we do not all reflect sufficiently on this aspect, and within a single study we can oscillate unconsciously

between two options, which produce amongst other things contradicting choices and methodologies.

Therefore, it seems important to us to confront some questions : What implications does the influence of one or another paradigm have on research into affect? Is it a definitive choice made a priori, or does it depend on the problem? What consequences does it have on the methods used? And what consequences does it have on the language used? And if it is a decision made a priori, is it a decision made by the researcher or by the field of research?

4. Conclusions

In this communication we have tried to highlight, using research on attitude as an example, that many important decisions made by the researcher are not rendered sufficiently explicit or even that the researcher himself remains unconscious of having made them. The importance of this consciousness and explicitness is linked on one hand to the quality of the research, and, in particular to its internal coherence, and on the other to the quality of communication.

The choices the researcher makes exist on various levels: the epistemological decisions appear particularly important, since they represent the framework within which the others are made. But it is exactly these epistemological choices that we are not used to reflecting and confronting ourselves with, one reason being that our research field is still relatively recent, and up to now has concentrated on other types of problems.

The choices and decisions we have talked about are influenced by the researcher's values, beliefs and emotions: the consciousness of these values, beliefs and emotions can therefore be a first step towards the clarifications necessary for making a productive comparison between different studies. If this consciousness is lacking, some important fundamental choices remain obscured, and this lack of initial clarity can only produce confusion at a theoretical level. The second step is to make these assumptions explicit, therefore assuming the responsibility for them: this is in some sense a brave decision, since explicit choices are easier to be attacked than implicit ones!

These are certainly general problems that regard mathematical education as a whole, and not just the field of affect. But we think that since we perform research *on* affect, we should become more responsible in recognising the role *of* affect in our research.

As regard our own position, we see attitude as an observer's construct, and, as such, useful if it is characterised as an instrument able to capture the specificity of mathematics education and, in particular, the deep interaction between affect and cognition. The choice of a 'bidimensional' definition of attitude (i.e. attitude is the pattern of beliefs and emotions associated to a certain subject) reflects these beliefs

and is linked to other epistemological choices: the choice of an interpretive paradigm instead of a normative one, the recognition of the deep interaction between affect and cognition, the recognition of mathematics education as an autonomous field of research.

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