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**On Humanizing Mathematics**  
**Nazla H.A.Khedre**

Prof. Of mathematics Education, Faculty of Education, Ain Shams University, Roxy -Xairo, Egypt.

**Introduction:**

Your lovely country reminds me with “ Clelia Borromeo “ ( 1684 \_ 1777 )<sup>(1)</sup> , An eminent Italian mathematician talented in languages ( including arabic ) , humanities & social science . She innovated “ flores geometrici “ -geometric flowers-, describing flowers curves of the form  $r = R \sin n\theta$  , who would be able to smell the scent of this geometric bouquet (fig.1).

When one makes a lively thrilling piece of mathematics as Clelia did , he may regard it as his child. Feeling mathematics as such , from my point of view is the way to think about humanizing mathematics. So, to get a clear idea about this issue, some explicit and implicit views of mathematicians on humanizing math are reviewed in the first part of this paper. Since it is difficult to disentangle human teaching from humanizing mathematics in the classroom, making connections with the teacher in humanistic curriculum is inevitable, this will be touched in the second part. Clustering the ideas from these parts, beside my long experiences regarding developing mathematics creativity and the innovative genius (to kids, students, teachers and researchers) triggers an approach I applied in my recent book (in arabic). Glimpses on this approach will be shown in the third part of this paper.

**1-Mathematicians’ views on humanizing math.**

Mathematicians rarely talk about mathematics or apologize when doing so. However, they reflect their feelings and intimate connections to math In quotes and casual sayings on what they do. Hence, their views on humanizing mathematics is expressed explicitly or implicitly as shown below.

-On calling math ‘Humanistic’, Reuben Hersh<sup>(2)</sup> seems to mean four corollaries of math Being ‘Something people do’

1) Math Changes with time.

2) Math Is a function of place, culture and social circumstances, i.e. Math is political.

3) Mathematicians are fallible (Mathematicians make mistakes)

4) Mathematicians interact with each others, ie. Math is something people do together, ie. it is sociable.

Hersh says “Our Mathematical ideas ...match our world for the same reason that our lungs match earth’s atmosphere”, when he first studied algebra he said “Math. Struck chord in me”

-For Derek Jacobi<sup>(2)</sup>, “The passions were one...There is no division between artist, scientist, poet and mathematician”

-Alan Turing<sup>(3)</sup> mentioned when he was a child “Numbers were my friends...they can be trusted...so wonderfully reliable...they never broke their own rules”. He prefers to call his invented computer, electronic brain or thinking machine.

-Helaman Ferguson<sup>(4)</sup> incorportes advanced topological ideas ( combined with space technollogy & ancient tradition) into his stone & bronze sculpture to immortalize math , He says “ sculptural beauty that moves souls & mathematical beauty that moves minds ... that is my work “

-A coherent team<sup>(2)</sup> ( Stan and others) speaking the same visual mathematical language carved a huge snow sculpture of costa minimal surfaces topology ( of negative Gaussian curvature ) . They together translate equations , directing equations as a virtual object using graphics ; & eliminating time consuming.. Carving was according to a planned 7 days schedule applying everyday a different math theory . ( e.g from shpere \_ topology of the holes \_ differetial geomtry \_ graphics ... a beautiful sculpture of Costa minimal surface . ) \_fig 2,3 one of the team said “ I become very excited about the intericate mathematical surface , which reminds me of a giant dinasour neckbone ... One of the memoreble events was an entire class of kg children allowed to slide down & crowl through our twisted shape ; their fear going and smiles upon emmerging.”

-Zerget<sup>(6)</sup> from some quotes , talks about human in mathematics & mathematician in the human . many other quotes are available in : mathfurm.edu/ ~m woodard/mquot.html .

To sum up mathematicians’ view on humanizing math grows out of their love for math , expressing their feelings through personifying & socializing math . They reflect the inner beauty of mind and soul to see math as a splendid fine art to be enjoyable and useful even to non mathematiccans

**2- The human curriculum and the teacher**

Humanistis believe that the function of the curriculum is to provide each learner with intrinsically rewarding experiences that contribute to personal liberation & development & to reach self actualization .

A humanistic curriculum demands the content of an emotional relationship between students & the teacher. The teacher must provide warmth & nuture emotions while continuing as a resource center.

The teachers motivate their students through mutual trust. They present materials imaginatively & creat challenge situations to facilate learning. They promote flow experience to let the student be involved in what he is doing so that he cannot separate himself from it <sup>(7,8,9)</sup>.

The humanistic teacher mostly has certain capabilities (competancies , charataristics) eg :

- To be real ( be natural , authentic not putting on appearances ). 1)
- Caring , acceptance & trusting & respecting his student . 2)

Empathic understanding ( listen comprehensively & caring about student feelings , listening to them even without talking ). 3)

In other words teaching in humanistic curriculum is teaching with heart and making healthy connection with students.

### 3-A suggested Family teaching approach to humanize math.

Borromean rings, a mathematical object related to Clelia's family is used to link the elements of the approach . These rings have a topological property, they are strong when linked together, if one fails the others will fail. Some assumptions from my previous work helped in clustering these elements and in inspiring the essentials of the approach, as shown below.

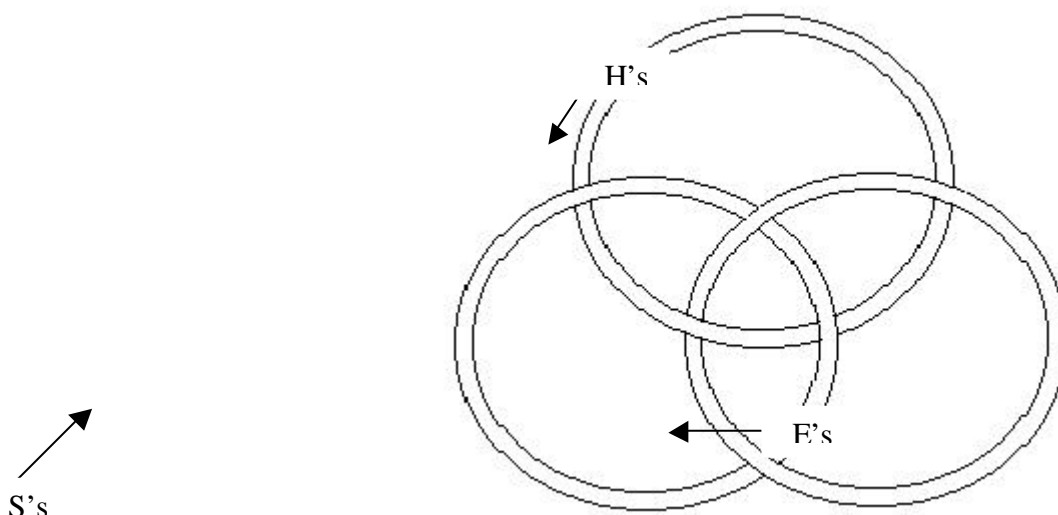
-The elements are represented symbolically in the linked rings, one for S's, the second for H's and the third for E's

S's : for senses , sensitivity ,sensors , sentimental , security , stability , struggling , scanning ( as guideline to the input )

H's : humanization , head (thinking , inventing , contemplating ) , hyprid, hyper, haunches , habitualization , hypnoses , ( leading to processing )

E's : ethics , eyes on , eagerness ( as away of control ) .

The bond of S's & H's & E's in the rings may remind us with our lady mathematician Clelia ( & with every caring mother. )



-assumptions from previous work

“ You are an artist and a mathematician by nature “ ( even the foetus , the first to hear in his mother heart beats . Heart beats are rhythm ( as in music ) & applied arithmetic) i.e the first learning is art & math related to the warm emotions of mum ( as for S's & H's & E's ) 1)

“Sensing ( & S's ) the beautiful nature is a source for learning , discovery & inventing“ ( according to Poincare : If nature were not beautiful , it would not be worth knowing & if nature were not worth knowing , life wouldn't be worth living “) 2)

“ kids use endless senses in learning as Helen Keller “ & teachers can train their endless senses as a non verbal language to use in interaction & feedbsck ( as keller's teacher ). 3)

Autonomy of learning and creativity is developed through integrating feelings, ideas and actions. 4)

The above elements, assumptions beside mathematicians' views and humanistic curriculum teacher presented here, highlight the following essentials of the suggested family approach.

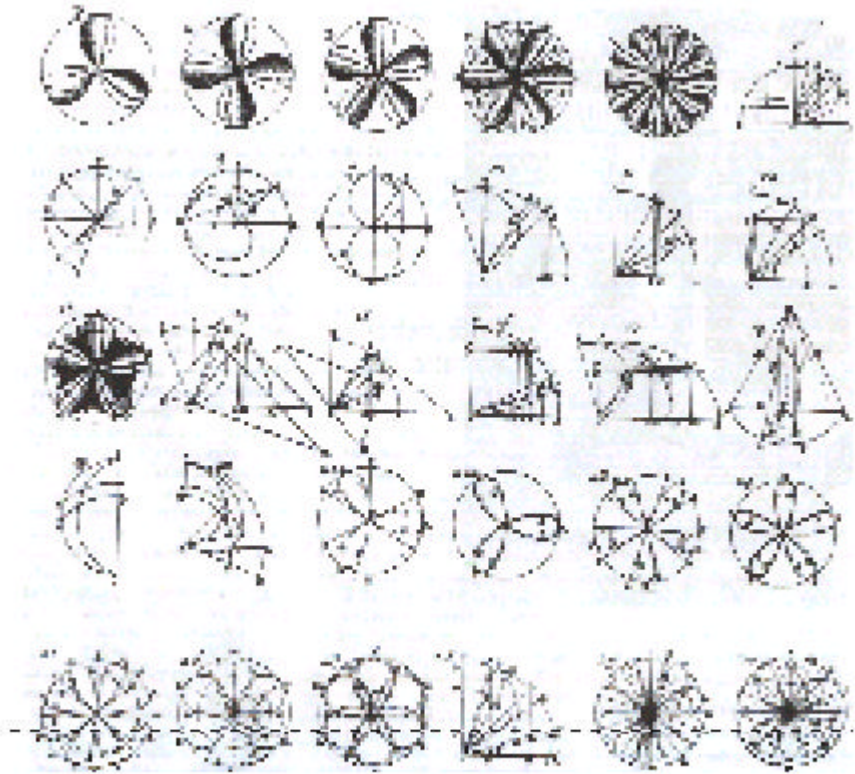
The strong bonding S's, H's, E's stands for the mother-like teacher (warm, caring, trusting, empathetic). With great sensitivity and accuracy recieves the non-verbal responses (emotional, mental behaviour, movements, actions,...) and verbal responses to process, guide, feedback and control. 1)

The learners like kids in a family including the youngest, the middle ones, the elder, i.e. a wide variety in age, sex, aptitude and concern, They learn cooperatively, helping by heart each other. 2)

The mother-like teacher (she or he with capability of S's, H's, E's) is the source of learning, stimulate learning by activities done before the kids, provide opportunities for the kids to be involved in searching for knowledge, making knowledge, discussing, analysing and constructing imaginative and creative artistic mathematical objects and ideas... then reflecting about them. Searching from nature, useful inventions, books, internet,...., this to match 'Herch' view, math is done by people working together. 3)

Mathematics content touches the changing math –traditionnal, 17<sup>th</sup>, 19<sup>th</sup> century maths and recent maths- to learn what mathematics really is – from Hersh's view. 4)

Finally, I applied the approach in my book (written in arabic for 13 years old kids) "Develop your artistic and mathematical gifts through spiral ; its connections and stories about it" where I got remarkable results and fantastic comments from mother and 4 kids. One might ask me, where is the father-like teacher? The answer, his role is eminent when dealing with regorous math. later.



**fig.1**



**fig.2**



**fig.3**

References

- "The mathematical intelligencer", Springer Verlog, NewYork. (1) fall 1999 pp(13-16) (2) winter 2000 (1-6)
- (3) fall 1991 (4) winter 1999 (5) fall 1999 pp(30-34) (6) spring 1998
- (7) McNeil, J : "Curriculum" Harper Collins 1990
- (8) Khedre, N : "On nurturing the innovative genius", Cairo, Journal of math Education, vol 3, July 2000
- (9) Khedre, N : many books in arabic to develop math for kids and on math Education.