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SENSUAL ACCESSES TO CHEMISTRY (PART 2)

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ABSTRACT

The "German Festival 2017" was coordinated by the German General Consulate of Ho Chi Minh City. This event has been realized by different German hosts and supported by important German enterprises. Of course it was an occasion to illustrate and to transfer German ideas for Vietnam also concerning educational ideas in general and in particular for chemistry education. Scientific literacy is important for the future society. In this meaning it is necessary that conveying through education system and school needs to extend by public events.

Keywords: research in chemistry teacher training, out of school education, intercultural education.

TÓM TẮT

Tiếp cận Hóa học qua giác quan (Phần 2)

"Lễ hội Đức được 2017" được tổ chức bởi Lãnh sự quán Đức tại TP Hồ Chí Minh. Sự kiện này được thực hiện và tài trợ bởi các doanh nghiệp và tổ chức Đức. Đây là một cơ hội để thể hiện và truyền tải những quan niệm của người Đức đến với Việt Nam cũng như sáng kiến về giáo dục nói chung và giáo dục Hóa học nói riêng. Giáo dục khoa học rất quan trọng cho xã hội tương lai. Trong bối cảnh hiện nay, sự truyền đạt kiến thức từ hệ thống giáo dục và nhà trường cần thiết được mở rộng qua các sự kiện công cộng.

Từ khóa: nghiên cứu trong đào tạo giáo viên, giáo dục ngoài giờ lên lớp, giáo dục liên văn hóa.

Observations and Experiences in Relation to Educational Basic Thoughts (compare Part 1)

Research Situation, Strategy and Methods

We connect our thought with our observations and experiences. Our reflections as result of the event show especially the basic legitimation assumptions in a theorizing and learning processes regarding perspective. Our knowledge and research methods combine qualitative and simple quantitative possibilities in order to "recognize" and therefore to

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capture the whole situation. Overall it was a situational research approach without fixations of detailed criteria and perspectives in advance. That needed to revert to experiences while acting. This is a possibility that every teacher should use in daily teaching. This situated educational field studies is heuristic oriented. Memorized observations, experiences, perceptions are hermeneutically described and interpreted. The "qualitative" results will be enriched by the quantitative data about the right and explained answers of the young participants concerning the sensual tasks. *Linh* marks this form of gaining knowledge as *"Methods of collecting knowledge by overall observation of the educational phenomena, especially through communication and discussions with participants, and memorizing as a fundament for reflections afterwards. Analyzing the questionnaire with answers of the children has eased this difficult awareness. The answers of the participants have been an important impulses also the observations of sensor and motivity".*

Science - in front - of stage – arrangement

The big bubble phenomena has been catching attention of the people passing by as expected (*Figure 1*). We have noticed many amazed young and old visitors that stopped for a look and a try. The phenomena „round about the soap bubbles" has been seen as aesthetically attractive as well as cognitively interesting and questioning. The shimmer moving soap bubbles as a symbol of a vanitas-imagination (*lat: vanitas = invalidity, futility, vanity*) provoke especially with their evanescence and their seemingly emptiness concerning thoughts and also possibilities of explanations. Children haven't reacted differently than generations of humans before them, wondering about beauty and momentariness at the same time.

Figure 1. *Soap bubbles production*

Some parents asked for substantial ingredients and recipes of bubble solution in order to reconstruct the bubbling phenomena at home. Curious children came in self-motivated mood to play and they asked for instructions and technical tips in order to

produce bubbles, especially big ones. Elder pupil (>10 years) were very excited and they asked for doing self-activities. Most of the young children (<10 years) needed to be motivated by their parents for action and sometimes children and parents did it together. A few parents who helped their children mentioned their worries concerning cleaning aspects. Those parents were sensitively aware that chemicals must be immediately washed away. Some children were afraid for example of being dirty or injured by the bubble solution. Those children participate by only observing the phenomena. Little children could hardly do big bubbles by themselves because they were not used handling the equipment (sizes of sticks and cords), and production of big bubbles needs also special handling skills. For young and old, for students, pupils, adults it was very hard to produce big bubbles. Some of them expressed their disappointment about their failing at producing big bubbles: The bubbles didn't stay stabile, but burst very quickly. Their assumption for failure was for example the hot and windy climatic conditions, but also the too strong blowing of the participants. Especially when they tried to catch the soap bubbles with the hands or when bubbles contacted a hindrance or when the children bloat the soap bubbles too intense. We have often observed experimental correction of behavior (gently bloating of soap bubbles) optimizing of the effects motivated the children. In fact the preparation and testing of production of soap bubbles took place under different conditions as at the German Festival. When we demonstrated big bubbles by ourselves we could see that visitors have observed stability and bursting, sizes, different forms, single and connected bubbles, dividing walls inside or between connected bubbles, uplift an flying, light interferences like colorfulness and darkness of the soap bubbles and the participants related their experiences to composition of soap bubble solution and properties of differentiated ingredients in the mixture.

Single questions towards us and the discussions about the phenomena "Bursting of soap bubbles" were about imaginations of a high air pressure towards the air within the bubbles, that means the bursting was caused from the inside. The adults assumed that although the spherical and with this curved soap skin is elastic and formable it can't prevent the bubble break. Younger participants has marked this phenomena as "explosion". It was interesting that in situative discussions with participants we could observe imaginations, that are related to items of the quantitative Young-Laplace-equation, e.g. internal pressure, ball shape or curved surface (*Figure 1*). The meaning of the soap solution has been always assumed and with this the term "surface tension" has been a foundation of this presumption.

Science - on stage- arrangement

The participation at the Science on stage activities was great, for the visitors of the German Festival it was also a fix point in the colorful and hectic promotion event. By spending time it was possible to do some cognitive activities. The science event was

limited for two hours (10-12 o'clock). In this time *Anh Khanh, Jürgen, Minh* and *Nhon* have guided and supported the participants. The price ceremony started at 13 o'clock on stage after 96 answer sheets have been evaluated *(Figure 2, compare Part 1; Figure 2)*. More than 90% of the participants have returned their answer sheets. On these sheets participants have written their names and ages, their average age was 11,9 years. The high return ratio shows the interest of the participants and also the behavioristic interests in attractive prices.

Figure 2. *Price ceremony*

A simple, through an excel-table calculation based frequency analyze of the answers by *Anh* shows in general in how far the senses as analytical skill of the participants has been developed. Through the black box-arrangement in the frame of the science on stage scenario the sensorial testing has been standardized *(comp. above)*. Five close to everydaylife substance/materials should have been identified through the senses "smelling" or "touching". After that the participants should have fixed their perception as a term by ticking the suitable box of the alternative answers on the sheet. More than 60% of all participants have "conceptual correctly" identified all five "substances". About 32% have related their perception with four right substance terms. All participants have at least one right answer *(Table 1)*.

Table 1. *Distribution concerning amount of correct answers (overall, N=96)*

Distribution concerning amount of correct answers (overall, N=96)						
Participants	**0**	**1**	**2**	**3**	**4**	**5 (max)**
Overall	-	-	1	6	31	58
Percentage	-	-	1,0%	6,3%	32,3%	60,4%

But the sensual identification of the substances is clearly different *(Table 2)*: The participants correctly identified more substances/materials by smelling (about 95%) than by touching (about 63%).

We haven't expected this result. We have recognized, that all participants, also older ones, must concentrate a lot in order to relate the result of the sensed characteristic of the substances/materials with the according term (compare Part 1, Figure 2). The tactile experience, motoric described as groping of a surface, could seldom be linguistic translated. Perhaps cognitive perceptions of substances through olfaction are more mentally represented as a feeling than cognitive sensation for tactile feeling of a surface. "Smelling" was very familiar and normal for the participants and somehow developed as a reflex reaction on the lime, soap and coffee smell impulse (*Table 2*). Only one participant (4 years) couldn't identify any of the substances. Almost every participants correctly recognized coffee (smell).

Table 2. *Correctly identified substances/materials (N=96)*

Correctly identified substances/materials (N=96)					
	Coffee	**Lime**	**Wood**	**Soap**	**Glass**
Correctly identified	95	94	93	92	60
Percentage	99,0%	97,9%	96,9%	95,8%	62,5%

Three participants (4 and 5 years old) couldn't palpate any of the materials or mark the corresponding term correctly. Wood has been palpated correctly almost by every one. About one third couldn't correctly "grab" glass (*Table 2, Table 3*). This has been mostly identified as metal, that means the term "metal" as alternative answer has been checked. This is surprising because metal sticks must have felt much cooler to the touch than glass, but there was no tactile reference for the participants. It might be that little pre-knowledge (pre-feeling) concerning glass, can be updated, mentally represented as imagination of something. From a functional perspective glass is mostly replaced by plastic – also in the Vietnamese everyday life culture.

Because of the age of the participants (about 62% are younger than 10 years) pre-operational and concrete operational interpretations can be expected from a development psychological perspectives without proving this assumption by the elementary finding design. Of course sensual perceptions in daily life are only casually and not in the meaning of a conscious cognitive act verbalized – through "touching" even less than through "smelling". Substances can be "understood" through grapping – like edibles as "finger-

food". The working group has discussed that sensual perception always occur combined in everydaylife and especially in connection visual senses (Becker, H.J., 1993). And also was discussed that a sensual reduced black box-arrangement hasn't been "close to reality" enough, and therefore not suitable to the "childish stage of age". We have also noticed that adults couldn't analyze the materials right away or not at all. The students have recognized that the palpating process could have been influenced by a feeling for the mass of the glass or wood chop sticks that have been similar in their form.

The participants have been 2 to 55 years old. Differences effected by ages documented as percentages in *Table 3* are of course random, although the group of the 11 to 20 years old participants is the most successful one with 68% of right answers. This group of age could sensory identify substances through smelling (100%) and also through touching (up to 68%).

Table 3. *Percentage of correct answers according to age-groups (N=96)*

Distribution concerning amount of correct answers (N=96)						
Participants	**0**	**1**	**2**	**3**	**4**	**5 (max)**
0-10 years old (N=59)	-	-	1,7%	8,5%	28,8%	61,0%
11-20 years old (N=19)	-	-	-	-	31,6%	68,4%
21-30 years old (N=13)	-	-	-	7,7%	38,5%	53,8%
31-40 years old (N=2)	-	-	-	-	50,0%	50,0%
41-50 years old (N=0)	-	-	-	-	-	-
> 51 years old (N=1)	-	-	-	-	100,0%	-
n.s. (N=2)	-	-	-	-	50,0%	50,0%

Making aware of verbalizing the solutions was a great problem, like *Anh Khanh* has heuristically noticed. Her perspective, founded on her perception, is compatible with scientific findings. By interpreting our descriptions of results she remarks: "*The participants have been effected by their emotion/feeling towards the substances in their process of finding the right answers. Therefore feelings/emotions as familiar imaginations have guided the sensory process of analyze. By this the participants have been rationally conscious of the substances. Some substances have been also more popular than others."* And *Anh Khanh* also arguments: "*Overall the properties of the participants like imagination, behavior, psychomotricity, parents, aspects of age and age range, attitudes… define the behavior. Therefore these factors influence also the solution of the questions."*

Anh Khanh has also reflected observations concerning verbalizing the actions of the participants. We have discussed these observations in the working group. Relating an abstract term to a phenomena, that means processes of building terms, are a long term cognitive act. They are principally necessary in order to communicate in standardized scientific way. By the way students have noticed that natural behavior especially the young participants needed to be exploited natural scientific, that means experiencing, noticing, observing, journalizing, comparing, interpreting or deducing, abstracting, problem solving.

Such behavior competences or education competences are also requested in Vietnamese chemistry teaching and from European perspective undefined as creative and critical thinking publicized (Doan, V.D., 2017, p.5-11; Phan, D.C.T & Nguyen T.N., 2017, p.99-109; Trinh, L.H.P., 2017, p.189-200; National Assembly of Vietnam, 2005)

Therefore daily life and everydaylife actions definitely provide methodical and conceptional impulses for scientific perspectives in the meaning of modern demands of competences. And as always there following can be observed in a context of substantial activities: **"***Some children were very afraid and they didn't dare to participate. Even when the black boxes has brought to them and they could see but they still hadn't the courage to take part",* so the observation of *Anh Khanh).*

Some young participants solved the problem with their peers, there were also some children who have been influenced by their parents. Some of them felt more confident with their parents. The impact of this group on behavior and of course the familiar education impact can be experienced in practice. Such versatile and also opposed influences has been observed in a phenomenological way by *Anh Khanh*:

- *Like: "When the children has been invited to join the activities their parents must agree first before they participated. Their parents have mostly decided for their children*".
- *And*: "*Some parents didn't let their children to join in. They were convinced that their children were to little to do it right and good. After convincing the parents concerning the education goals they agreed and let their children play."*
- *Or*: *" Some parents asked for entrance fees before joining the playful activities. They thought that these activities must cost money. They were surprised that it was for free",* a probably typical reaction in Vietnam.
- *Also oppositional*: *"There have been in general to sorts of parents that accompanied their children into the tent/on stage. The first kind of parents instructed and explained their children every step, because they were* afraid, *that children wouldn't manage to listen to the guidance/ instructors (students). The other sort didn't interfere and let the children experience and handle by themselves."*

Also *Quang* has reported that parents have been helpful supporting with experimental behavior by the soap bubbles production. They guided their children by their practical action. Especially the experimental demonstration is an expected methodical measure for young children. Behavior can be imitated.

A gender-specific analyze of the answers was actually intended. The answer sheet, designed by *Jürgen* and *Quang* from a German cultural perspective, should have marked the gender by the name of the participants. The Vietnamese students have analogously translated the answer sheet into Vietnamese language and they have simplified it according to the specific arrangement. While the data analyzing process we have noticed that Vietnamese names aren't gender-specific definite. Different cultural perspectives and adaption of the answer sheet show once more the cultural aspects of educational or pedagogical activities.

Résumés, Conclusion and Reflections

Pedagogical and methodological overall view

All participants agree with the perspective that it is necessary to use and to make aware of sensual skills in the meaning of an orientation help for daily life. With this children can be stimulated to think about their decisions for the substance quality and to explain themselves: Which substances could be sensually identified? Making aware is a great thinking potential and an important connection factor for a development of chemical thinking: A difficult way.

Students are handling with an epistemological question: Which possibilities are given in order to describe and objectively "train" social realities like educational processes? Students get trained to collect and to fix knowledge, insights, connections and experiences by action research. This is an important competence for later behavior besides special qualification. Overall and especially for the students the German Festival has been a good practice example.

Knowledge is a requirement for behavior changing but this alone is not enough: Perhaps such impulses can be helpful in order to use the senses in daily life knowingly. Such a project would have a quality of attitude education. For Vietnam this is an important task for nature science education contexts. Chemical education must also be shown through behavior especially the academic literate members must be role models of society. This would be helpful for the overall social situation especially considering the critical environment status in Vietnam (Becker, H.-J. & Nguyen, M.Q., 2017, p. 94-98). This is a difficult task, because of problem situation made by chemistry, although these were caused by human and economical misbehavior. Chemical knowledge is only used and exploited without regarding relativities and consequences.

The discussions about behavioristic perception, instructing behavior for children, mirror the ambivalence of this decision, motivating for educative behavior. The prizes have a stimulating function for doing some chemical activities, although they don't really solve the problem how to awake and build "real" interests. But all participants took the chance building new thinking structures as building new cognitions or extending existing structures, in order to leave traces in thinking for application in similar future situations as behavior standard for new realities.

Personal estimations as differentiated mental hierarchies

Didactical yield as personal estimations of us all fixes also the personal gains and the point of view on the corporate event afterwards in the whole complexity. The statements of the participants mirror the individual perspectives and reveal thinking structures or mental hierarchies of all participants.

- *Anh* recognizes that *"the meaning of out-of-school education activities as a model situation for Vietnam - such events are also necessary in order to convey elementary, simple contexts with daily life"*.

- *Minh* sums up *that "natural behavior pattern and skills of children can be made aware of and they can be integrated in a context with an imagination of 'Chemistry'"*. She supposes *"that structures of school chemistry teaching conveyed as abstracted formula symbol gain and expand its meaning through accentuation of senses"*. *Minh* also supposes: *"With this chemistry teacher get awaken to expectations that need to be fulfilled"*.
- *Linh* regards the science-on-stage idea as a double chance, when actively participating children provide a surveillance framework for spectators which is more than just show elements. *"The publicity gets also the chance getting informed", Linh* said. She stresses the meaning of the contents and activities as a programmatic approach for the general educational chemistry teaching without neglecting the problems.
- *Anh Khanh* is aware of the closeness of her task experiencing and accompanying evaluations, decisions of the children concerning substantial phenomena to later teaching processes. The observed action and thinking processes of the children are a heuristic impulse for dealing with children's imaginations, for building up theories and abstracting and structuring through terms. She is surprised *"in how far parents occasionally regulated children's behavior"* and she compares this observing with the educative situation in Vietnam.
- *Nhon* focuses precisely, that out-of-school education activities can modify imagination and popularity of chemistry, and they can convey connections between concrete phenomena on the one side and modeled abstractions on the other side. *Nhon* has the point of view that a scientific perspective can also be developed out of everydaylife contexts.
- *Quang* expresses that the cooperation project between the *Ho Chi Minh City University of Education (HCMCUE)* and the *International German School (IGS)* has been an overall success in versatile perspectives. From the view of the *IGS* it was a great chance to elate children and parents for chemistry and especially for pupil orientated teaching approaches: Offering young learners access to chemistry through sensual perception. The great enthusiasm of the participants on the German Festival as well as the cognition of the participants while playful handling with soap bubbles have confirmed the positive effect of this approach for nature science teaching. Especially the soap bubbles were sensual examples for early nature science teaching program at *IGS*.
- *Jürgen* has been impressed by student's activities, mindset and attitudes especially in the frame of theoretical interpretations and reflections beside all regards to contents, programmatic and situated project aspects. The students *Anh, Anh Khanh, Linh, Minh* and *Nhon* have voluntarily performed this task from situative as well as professional interests in a concentrated, critical, problem oriented, self dependent and creative way. The concentration on "something" is a central perspective for pedagogical actors, for their studies at the *HCMCUE* and is a central point of the education reformation (Central Committee of the Communist Party of Vietnam, 2013, Chapter B.2; Nguyễn, H.G., 2011, p.64). This great attention of the students has also been shown by the common work on this article.

Beside perspectives with regard to contents (legitimation level) we all experienced that interaction processes and especially communication processes have been meaningful, exciting, but also difficult - also in an intercultural view: Trilingualism "German", "English", "Vietnamese" made us conscious that special terms are always charged with a cultural awareness. The problematical dealing with "meant" meanings was experienced by

all Vietnamese students in a sensitive, concentrated and reflected way. It was noticeable that thinking in Vietnamese language was more phenomenological than described in generic terms as given scopes of view of reality. Inductive and deductive approaches complemented and required each other. In general it is necessary that lecturer must concentrate on personal response as feedback in order to regard attitudes and imaginations of students. They have to give answers how evident scientific findings are generated to design chemistry teaching based on scientific and epistemological research. This aspect will decide about the future of the Methodology as an scientific discipline (Đào, T.H.H., 2014, p. 124-133.

Chemistry teaching will profit by this.

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