

PROCESSES FOR ACTIVATING THE PERSONAL REFLECTION OF STUDENTS IN BIOLOGY EDUCATION

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ABSTRACT. In this article there is a real perspective outlined for activating the personal reflection of students in biology education. Here is introduced a set of mental and emotional- volitional processes for bringing the reflection to the path of personal development and self- development of the student. In order of fulfilling those processes there are offered example activities- methods with appropriate for them reflective means, deliberately chosen and headed towards self- knowledge of the student in the context of different syllabus.

KEY WORDS. personal reflection, self- knowledge and self- determining; motivation for self- perfection, forming goals, planning, anticipation, experience, methods and reflective means.

At the end of XX and the beginning of XXI the efforts of the pedagogues worldwide are pointed to achieving literacy in the nature studies (UNESKO, 1993; Holbrook, 2000), including biology (Biological Perspectives, 2003; Project 2000; Project 2061). There are projects running for completing education where the stress is upon the processes helping the student realize the role of the natural science including biology as a way to get to know the world, the nature him/her- self. Special attention is paid on the processes, which start the intellectual reflection of the student on his/her own thinking activity in studying the nature in order to encourage the forming and development of his/her biology literacy. This however does not mean that the self- efficiency is underestimated of the student. There are ways to find for increasing the self- efficiency throughout updating the self- reflection (Maurer, 2003). It is

considered that the consciously created reflective processes in this direction help developing biology literacy. Moreover they provide inner conditions for personal growth and proving, which is the goal of every contemporary education.

The goal of that article is to present basic processes for purposeful activating the self- reflection of the student and methods (means) for carrying them out in biology education.

Reflection is mental procedure with socio- cultural origin realized by the subject and pointed towards self- knowledge, which is up- dated in different fields of human activity. When this procedure is focused on the characteristics and the features of the person, the personal world and behavior reflection appears as *personal*. Most often it appears in situations where there is a dialogue, opinions or reconsidering the intentions or actions in personal conflicts. The result of carrying out the self- reflection is that the subject learns about his/her personal qualities. The opinion that this reflective skill is basic for self- development and self- perfection of the human as a person and a professional is strongly supported (Stepanov et al., 1985; Vasilev, 2000).

The personal reflection may occur spontaneously during different activities and communication among students and teachers. However, undoubtedly it will occur with better quality if there is something done for its forming and development in earlier age.

In the combination of mental and emotional- volitional psychological processes which can up- date the personal reflection of the biology student we concentrate on the following *main processes*:

- *Self- determining;*
- *Motivation for self- perfection;*
- *Forming goals (the stress is on the inner goals);*
- *Planning;*
- *Anticipation;*
- *Experience.*

Self- knowledge is personal and often contradictory process in examining the own self. As a result the student achieves knowledge about his/her abilities, qualities, needs, interests, motives and feelings and also is realized the own unique identity.

So then the self- knowledge is an important side of the socio- cultural competency presented in the national educational standards. The main reference point in biology education is the concrete schedule showing the diversity and interaction between the animate and inanimate nature on which base the student can examine his/her personal idiosyncrasy. Most often in the educational process the student gets self- knowledge spontaneously. However the intuitive summery of the idea of oneself cannot serve as a reliable source and stimulation for self- perfection. Moreover the immediate examining of oneself or the intuitive summary of previous experience as follows `I can`/ `I cannot`... does not give the person direction to find ways for self- development neither guarantees real self- knowledge.

☞ One of the most quality processes for objective, impartial self- knowledge is the *self- determination*, throughout which the personal reflection is determined. Its essence is expressed in specifying the exact place of the subject in a problematic situation in conformity with the personal potential (knowledge, skills, qualities, experience etc.). In contrast to the self- concentration, the self- determination fulfils throughout certain `instruments` like schemes (criteria, theoretical models of professions etc.) or appropriate means created in the cultural history of mankind. Throughout these instruments the subject can evaluate impartially, accurately and critically certain skills or see the level of his/her personal or professional development. Based on self- evaluation he/she can make better for his/her self- development (Vasilev, 2000, p. 239- 241).

The need of self- knowledge appears in the educational process and in the communication with others (teacher, classmate). This need pushes the person towards self- perfection, expressed in aspiration for increasing the knowledge and culture.

☞ *Self- perfection* is a way for the subject to form him/herself as a person, to develop his/her skills. The motives for self- perfection are formed most successfully if during education there are: realizing and development of the need of self- respect and social prestige, recognition from the others; knowing methods for self- learning- as a subject and as a person; realizing the difference between ideal `I` and real `I`; self- evaluation (Iliyn, 2002, p. 225).

The cognitive psychologists *put the goal- getting, planning, and anticipation* to the category of „meta- cognitive processes“, which are responsible for the conscious regulation of the self- activity and behavior (Kholodnaja, 1997; Maurer, 2003):

☞ The direct attitude of the goal- forming with the forming of the upper understructures of the personality (including self- knowledge) determines its place in the processes updating the personal reflection. With the term *goal- forming* is introduced the process of determining and formulating the pedagogical goals and their appreciation of the student. It could be *extrinsic* (according the regional law) or *intrinsic* (reformulating of the extrinsic goals and turning them into personal goals). When the goals are formulated and graded independently or with the help of the tutor they turn into engine of activity and behavior of the student (Nikolov, 1987, p. 7).

Because of partial coincidence of goals and motives in the behavior, the goal- forming is close to the problem of *motivation* in education. In fact motivation is very often treated as a process, which is included in the goal- forming because of it the person chooses to do something or not to get certain goals. When a person lays certain goals he/she analyses and estimates his/her potentialities for their achievement, he/she compares his/her qualities to the results achieved, which is an act of personal reflection. Considered in this aspect the goal- forming is also a reflection process (Nikolov, 1987; Hutorskoy, 2001).

In pedagogical plan the processes *goal- forming, goal- getting* and *goal- achieving* differ. The goal- getting is done according the schedule and the aims of the subject. Usually the teacher lays the goals and the student achieves them.

The forming is equally important for the teacher as for the student. It is necessary for the teacher to plan the education according the law and the training

specifications recognizing the level of preparation of the students, their motives to study in concrete didactic situation. The goal-forming done by the student turns him/her into subject of the activity, following his/her own educational trajectory. In this occasion the goal-getting of the student is more productive therefore the teacher's as well (Hutorskoy, 2001).

☞ Building own hierarchy of goals brings into consideration the matter with the choice and the planning ways of achieving the needed outcome. With the term *planning* we mark the process of careful consideration and determining the methods, means and order of activities necessary for achieving certain pedagogical goal. Good planning gives basic scheme, which guides and regulates the behavior of the subject towards the goal (Kholodnaja, 1997, p. 208).

The effect of the planning depends to a great extent on the analysis of the own level (experience, personal qualities, difficulties etc.), which the subject compares to the perfectly given goals. Such self-assessment, preceded by careful self-analysis and analysis of a certain educational training helps creating optimal and realistic schedule of one's own activities. Not less important condition for rational planning is clearly set final goal, set to the level of interstitial goals and tasks. On this basis it is possible more accurate to foresee the ways of control of the pedagogical activity, to define the deadline and to make decisions for appropriate behavior.

☞ The meta-cognitive processes goal-forming and planning are in close interaction with the *anticipation*. It is preliminarily acceptance of certain statement for true expecting it to be proved true later. The anticipation appears as preliminary idea for expected facts or vents. This idea has possible character and controls the behavior of the subject through the back connection, which appears between the expected event and the real conditions for its carrying out (Metchkov, 1993, p. 138).

Anticipation is considered for essential indication and important condition, which the productivity of any conscious human activity depends on, including the pedagogical one. Except for foreseeing the final goal or the interstitial goals, the alternatives or the stages of the activity, the anticipation appears as preliminary expectation for possible consequences for the subject and the others because of certain activities. To foresee the possible effects of the planned activities more accurate, the subject evaluates his/her experience opposing it to the mentioned ways of acting and the real conditions for their carrying out in other words he/she carries out reflection upon his/her personality.

In the professional activity of the teacher the anticipation updates in the selection, building and rebuilding the training activities in order to show the stress in it according to the given didactic goals; in foreseeing the possible effects of the methods chosen and means of education and upbringing; in guiding through education for getting goals; in determining the possible reactions of the students during their own activity and behavior (Desev, 2000).

In the cognitive activity of the student the anticipation of the student updates in foreseeing the possible effects coming from the methods chosen and means of studying; in self-government of the training for getting goals; through self-restrictions in the joint action with the students etc.

☞ The *experience* is a process in which the subject expresses certain emotional attitude about the objects in the world, about the `Others`, about him/herself. Quite often the concept' *emotional phenomenon*` is used as an equivalent of the experience. It is considered that the emotional phenomena are `language` of the subjective, because they mirror not the outer reality but the attitude of the subject about it, his/her inner condition (Vekker, 2000, p. 393)

Defining for the experience are the indications assessment and objectivity of the emotional attitude. The evaluations express the notoriety, the personal sense which people ascribe to some object or situation, in other words they characterize the subjective (affective) side of the experience. The content of the object or the situation provoking the respective emotion characterize the objective (cognitive) side of the experience. Although the affective aspects more often combine with the cognitive, if the evaluation predominates, the experience is defined as emotional (Minchev, 1998, p. 123)

Main source for appearance and development of the emotional phenomena in the pedagogical process is the interaction of the subject (teacher, student) with the educational surrounding. It creates different in significance and various in content and functions emotional experiences, which induce the whole educational process: they warn about connection `need- process of satisfying`, give energy to the to the motives of the activity (Desev, 2000, p. 192), activate, organize and guide the cognitive processes, as in some cases they lead to results, control the communication and the socialization of the student, they determine the emotional style of his/her behavior and separate features of his/her personality (Izard, 1999).

Those we have mentioned and other effects we do not examine give idea about the role and the place of the affective- evaluation experiences in the whole development of the student.

Here we put stress on the realization processes, *expressing* and *restricting* the own emotional experiences because they move the subject towards fully expressing the inner strength and abilities.

We should have in mind that in a problematic situation the information received speeds up the transformation of the emotional schemes throughout which the experiences have been revised before. Those schemes are inner models which are kept in the memory of the person and combine the characteristics of different situations and events calling similar experiences. Usually the emotional schemes are not recognized by the person and they exist as `potential emotions`. The tutor can activate their recognition if he/she push the student`s attention towards reflective analysis, revealing and considering the motives and the sources of certain feelings (positive or negative). Of course strength with which the feelings are recognized depends on the ability of the subject to investigate him/herself. When there are conditions throughout the education everyone to be able to *express freely feelings and thoughts* (Habershaw, et al., 1992) and to *restrict* his/her own behavior, the idea of the person of him/herself enriches and the trust towards oneself and `the others` gets bigger (Rogers, 1971). It is not necessary to be made a special psychological-pedagogical research to claim that with trust and understanding between all the

subjects in the education the interaction could be a positive emotional event every time, apart from the result.

The characteristic of the overviewed processes represents the question *how, in what way could they be put in action in biology education*. It is absolutely possible to be updated the personal reflection in the development of different processes that is why here are sought no specific ways to provoke its appearance. There are various methods of education, which prescribe because of need reflective display because it is characteristic of activity and of communication. However it is acceptable to be accepted the existence of specific so called *reflective means*, which have an important role in the forming and development of reflectivity when they are include in common knowledge activity and in communication along with sensible educational methods. Without pretending to comprehensive, I will offer here a set of example methods with relevant reflective means pointed towards activating the personal reflection in biology education. Appropriate for this case are the methods:

- *Consultation*;
- *SWOT - analysis*;
- *Goals – tasks - priorities*;
- *Assessment of the outcome*;
- *Incident etc.*

📄 The *consultation* is a dialogical method in which a person asks certain questions and another person (persons) answer. In the pedagogical practice usually are applied two main ways of consultation- interviewing and inquiry. *Interviewing* is a consultation, which requires straight verbal communication between the subjects `here` and `now`. A characteristic of that method is its adaptability- depending on the answers of the interviewee the interviewer can change the sequence of the prepared questions, to ask new questions etc. Usually the questions and answers are verbal but they can be recorded with audio or video means. The *inquiry* may be done without the inquirer being at the spot. Its characteristic is the static character. There is a questionnaire, which is prepared in advance on paper without being changed during the inquiry. Most often the wanted answer should be in a written form (Handal, et al., 1987; Osterman, et al. 1993, p. 70).

📁 Specific means, which turn these two methods in precious instrument for self- knowledge, are the so- called *reflective questions*. They direct the subject towards purposeful self- acceptance, self- observing, self- description, and self- evaluation. The offered *examples for reflective questions* down are appropriate for inquiry or an interview for students before and after studying a topic from the biology schedule or interesting exercises at the end of the term:

- What did I learn and understand while studying the subject?
- What were my best results? How did I achieve them?
- What kind of difficulties did I have during education? Did I overcome the problems? In what way?
- Which of my skills helped most (or perplexed) the effectiveness of my work?
- Did my own idea of myself changed during education? How exactly?
- Which was the most interesting situation during education?

- What would you wish to your classmates and yourself at the end of the education?

In order to activate the personal reflection of the students the questionnaires may be thematically directed to self- observing of personal skills and abilities necessary for better studying determining motives priorities and expectations concerning the biology education. Short interviews can be done in front of a group or the whole class moreover its recommendable if the student changes roles interviewee-interviewer so to enrich his/her experience.

☞ *SWOT*- *analysis** is a method requiring the subject build objective idea of his/her momentary condition analyzing his/her weak or strong sides, identifies all the factors defining the efficiency of the forthcoming or already completed activity (Kyle, 2005). Every student writes down the results of the analysis in a form in special reflective diaries (we` ll mention them later). The systematic information in the text is useful mean for self- knowledge, motivates the student to be responsible for his/her learning and shows what can be changed for better results. In the meantime the tutor receives information necessary for further organization of the education.

☞ *Goals- tasks- priorities* is a method, which asks the student formulate tasks and goals, to estimate his/her real possibilities for achieving those goals, to compare his/her tasks with the other` s tasks. The method requires team work (DeBono, 1997) and follows the scheme:

- The team formulates an interesting and important task.
- The team determines and describes basic characteristics of the person (knowledge, skills, and qualities) who is getting the goal.
- Every participant outlines basic tasks showing the stages necessary for achieving the goal.
- The team separates in small groups. In every group there is a discussion to be chosen the best way for achieving the goal.
- Every group presents its decision.

The attention is concerned with the variety of suggestions for tasks and the common between them. There is a comment if the task offered would give result. It is assessed to what extent the characteristics of every participant and the group as a whole would help getting the goal.

☞ *Assessment of the outcome (plus, minus, risks)* is a method, which stresses the anticipation of the possible outcomes in carrying out certain activity. The method reduces the risk of inconvenient or irrational decisions, because it requires from the subject expected assessment and the possible effects from any activity along the way to the goal (DeBono, 1997).

Basic means for applying the method are the questions concerning analysis of the goals and the results of the activity as well as with its level analysis:

*The abbreviation SWOT-analysis is meaning: strength, weakness, opportunity, threat.

- What are the expected advantages of the activity?
- What are the possible disadvantages (risks) at every step towards the goal?
- What could the consequences be (social, moral, ethical) because of the activity?

📖 The *incident* is kind of the situation analysis*. Most characteristic for an accident are bad conditions for making a decision: not enough information, not enough time, and emergency situation, danger for health or life. These are signs of critical situations in real life, when one act impulsively, loses self-control and therefore the decisions are ineffective based on personal schemes of behavior achieved from past experience (Andreev, 1996, p. 237; Kostova, 1999).

This method attracts with its orientation towards development a complex of practical, knowledgeable and communicative skills, which explains its popularity in the pedagogical practice in biology. It has a rich potential when are sought ways for activating the personal reflectivity because of its purposefulness: to ensure conditions for overcoming the inertness of the person, to regulate the emotional condition of the student and to make it easy for him/her to create effective models of behavior for reflective activities in a problem-situation. Having in mind the experience of every participant to live through the incident again with the other participants it can be said that his/her chances to act properly in a real situation get bigger. The method prescribes team-work on different stages as in the situation analysis.

- The students are separated in small groups. A problem-situation is discussed for limited time. The suggestions are discussed and the best is chosen. It is possible to ask for an intellectual card which to show the positives and negatives of the suggestion. (Kostova, 1999, p. 105).

To make the situation closer to the real life the time given could be limited even more.

- The suggestion is presented for discussion among the groups. It is possible to ask the groups to put the opinion of the others in the intellectual card.

- The discussion can be directed to the emotional experience of the students through appropriate questions. eg. What were the feelings you felt during the exercise? Which was nice for you (negative)? Who of your partners helped you most?

The efficiency of the method gets better when are used worksheets with texts and pictures or other didactic aids showing real emergency situations in the scientific or practical activity of the people working in the biology field. The stress is upon the correct decisions in these situations and the questions can enrich the experience of the students for self-knowledge.

📁 Basic didactic mean here is the *educational text*. `Classical` examples for educational text are the forms of the educational problems, the educational questions and the educational tasks given throughout the biology curriculum.

*The *situational analysis* is an educational method where you look for decision of specially created task, taken from life.

Other reflective questions except the shown above, which go with the methods, are the *reflective journals*. They keep precious information for the experience of the students gained during the education and give material for reflection over the own experience. The diaries give the person chance to create an intransitive dialog and to turn the results of his/her experience into text (evaluation). The texts represent the student`s attempts for self- defining, for evaluation of his/her achievements; they help them understand themselves, and think over their uniqueness (Hall, 1997; Hutorskoy, 2001; Osterman, et al., 1993). Although the creation and reading journals does not guarantee the manifestations of realized reflectivity the effect is always in direction of personal growth and self- development (Pigrov, 2002).

Although there are not strictly set requirements about the form of the reflective journals, most commonly it consists of:

- Visiting card, personal emblem or motto/credo.
- Introductory page about the functions of the journal as an educational document.
- Pages including reflective questions requiring forming goals, expressing personal opinion about the educational activity, defining personal achievements and the difficulties, successes and failures, satisfaction, strong and weak points, attitude towards the others, communicative level etc. The students answer those questions during the education- at the end of the class or other time given by the tutor.
- Conclusion page where the student defines his/her achievements gained in result of the education.

Keeping a journal is recommendable not only for students but also for beginner teachers to gain idea of their professional experience and building own theories for teaching (Hall, 1997).

Videotaping lessons are often used reflective means for education of future teachers (Handal, et al., 1987). Fragments of experienced activity can be seen many times. Seeing again interesting difficult moments activates the reflectivity of the spectators and allows making a critical analysis.

Although now those means are not used widely in the Bulgarian school they are starting to become part of the class activity, which gives hope.

The shown set of processes activating the personal reflectivity is open and here may be added other appropriate procedures. As it was shown here the main idea is not to discover new specific means, but to set the direction for most productive usage of those in the biology teaching. They are used not only for shaping reflective processes but also to introduce new techniques. My own reflectivity showed me that the modern biology education needs not standard or artificial practice but such created and experienced by the teachers themselves.

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