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**INFLUENCE OF REFLECTION ON STUDENTS' COGNITIVE
STATES IN THE EDUCATIONAL ACTIVITY**

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Abstract

The article presents the results of studying the influence of reflection on students' cognitive states in educational activities. Students of both genders trained in different specialties (humanities and natural-science) took part in the research: 143 students aged between 18 and 22. The impact of reflection on students' mental states was researched during learning activities (at a lecture and seminar): the intensity of mental states was measured. The diagnostics of reflection and personality regulatory abilities was then carried out in form of extra class activity. SPSS 16.0 program was applied to process the results. Typical states with different levels of reflection in everyday and intense situations of learning activity are revealed. The greatest differences in the experience of states between students with different levels of reflection were found in situations related to exams: in a tense situation, high reflexive students often experience low-intensity cognitive states, while low reflexive often experience high and low intensity states.

It is established that the influence of reflection on cognitive states is mediated by the level of the subject's regulatory abilities: students with the same level of regulatory ability and reflection, experience the most intense cognitive states.

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1. Introduction

An urgent problem of psychology and related sciences (pedagogy, sociology, philosophy, physiology, etc.) is the study of the psychological mechanisms of regulatory processes, which is led by the mental states. Among them, a special position belongs to reflection; awareness of one's actions, behaviour, and other forms of human activity, including the mental states of the subject.

In our previous articles, we showed that studying the reflexive mechanisms of state regulation will reveal the psychological regularities of this process, establish relations between the components of reflection and mental states, and determine the role of reflection as the most important component of consciousness in the regulatory process (Prokhorov, Chernov, 2014, 2016).

2. Problem Statement

Reflection is considered in psychology as "the process of subjects' reflections of their own mentality contents, self-perceptions of mental processes, properties, states, and their regulation" (Karpov, Skityaeva, 2005, p. 20). In some papers, an importance is given to the value mechanisms of mental activity regulation (Salikhova, 2009, 2013). Also shown are the relationship between students' reflection and their aggressiveness in educational activities (Valiullina, 2016).

Most often, reflection is manifested in the educational process and during the experience of cognitive states. This is the reason for the usage of students as samples and as the main group of subjects.

3. Research Questions

Studies relating to the problem of cognitive states can be divided into three large groups. The first group includes general psychological studies of various aspects of human cognition, which are of practical importance for the psychology of learning, cognitive psychology, self-regulation of states, and others: studies of intellectual emotions (Tikhomirov, 2002;) and emotional states associated with prognosis and expectation (Izard, 2000). Studies of meta-emotions and their influence on the direction of emotional reactions and the regulation of cognitive activity (Mitmansgruber et al., 2009). Negative states (anxiety, fear, fatigue, etc.) are associated with disorganization of cognitive processes and a decrease in their productivity. Positive states (calmness, interest, joy, etc.) are regarded as an important factor in enhancing the intellectual effectiveness of students (Fredrickson, 2000).

The second group includes the studies of cognitive processes and states in educational activities. We studied the metacognitive states that arise in the process of solving problems, for example, "feelings of difficulty" which affect the productivity of students (Efklides, 2001). We investigated the influence of negative mental states on academic success. For example, anxiety and the state of "dislike for discipline" significantly worsen learning achievements.

The third direction is the study of metacognitive aspect of cognitive states in the learning process of mathematics and other natural sciences (Stillman & Galbraith, 1998).

Reflection, considered as a tendency to self-analyse (psychological mindedness), is often defined as the ability and inclination to think of oneself and others as subjects driven by internal states (Grant, 2001). Another approach is to relate reflection to metacognition. Metacognition means knowing yourself as a learning subject and regulating your own cognition (Flavell, 1976). Another approach defines

reflection as awareness, which involves thinking about personal experience (Wegner, 2005). Representatives of this approach believe that reflection can be wrong when the subject imagines some of his actions or mental processes, but not in the way they really were.

4. Purpose of the Study

The question of intellectual reflection in the study of Paris and Winograd (1990) was intensively developed, which demonstrates that students can improve their learning by studying their own thinking. The authors note that teaching metacognitive processes will improve the outcomes of learning. In the psychological study of Wilson and Skuler (1991), the inclusion of the process of reflection on the grounds of students' decisions led to a decrease in the objectivity of judgments about the quality of the lecture course.

Therefore, we can conclude that self-regulation cannot be done without a well-established feedback system. Reflection as a feedback mechanism in the life of a person is not only a certain result, but also a process that is associated with internal transformations, a reconsideration of the characteristics of the mental state. In this context, further research was carried out on the reflexive regulation of cognitive mental states in student's educational activities.

5. Research Methods

To study the influence of reflection on the intensity of students' cognitive states, two samples were formed. One group consisted of 2-3 year students of technical specialties (73 people), and the other one – students of humanitarian specialties of Kazan Federal University (75 people) aged 18-20 years. The study was conducted in 3 different forms of educational activity (lecture, seminar and examination), during which states of students were recorded. Features of self-regulation and reflection of students were studied. Out of the total number of respondents, three groups were formed according to the criterion of the level of reflection: "low reflexive", "medium reflexive" and "highly reflexive" students.

We used the following psycho-diagnostic techniques:

1. Grant's technique of the expressiveness of reflection orientation including scales of socio-reflection and self-reflection (Grant, 2001);
2. Karpov and Ponomaryova's technique of diagnosing the general degree of reflection development, including diagnostics of retrospective reflection, actual and perspective activity, and communicative reflection (Karpov & Skityaeva, 2005).
3. Schraw & Dennison technique of diagnosing metacognitive inclusiveness in activities (MAI) (1994);
4. Nikiforov's technique of diagnosing the processes self-control development (Nikiforov, 1988);
5. Questionnaire - "Style of behaviour self-control" by Morosanova & Konož (1995);
6. Prokhorov's technique - "Relief of a personality mental state" (2004). This technique allows you to measure the characteristics of the mental state: mental processes, physiological reactions, experiences and behaviour.

The degree of structural organization was calculated according to Karpov's method. The sense of this method is to attribute scores to correlation links having different degrees of significance.

Accordingly, the index of structural organization (ISO) was estimated; 1 score was attributed to links at the level of statistical importance $p \leq 0.05$, 2 scores at the level of $p \leq 0.01$, and 3 at the level of $p \leq 0.001$. The parameter having the greatest score on all statistically significant links is considered as the leading one in the structure. The following was used in the research: the correlation analysis (Pearson's method), one-factor and multiple-factor dispersive analysis (MANOVA), and structural analysis (the index of structure organization was calculated). SPSS 16.0 program was applied to process the results.

6. Findings

The influence of reflection on the cognitive states of students in everyday educational activities. Based on the research, it was established that mental states of interest and tranquillity are the "typical" states experienced by students in everyday educational activities. Students most often experience these states during lectures and seminars.

The most significant influence on the state of interest is provided by self-reflection ($p < 0.05$, f -Fisher = 1.450). The most intense state of interest is experienced in the case of an average self-reflection. These results can be explained by the fact that excessive attention to one's inner experiences does not allow the subject to concentrate on external activities, which leads to a decrease in interest. This is expressed in a decrease in behavioural activity. At the same time, insufficient attention to oneself is accompanied by a decreased interest in the subject of educational activity. Only a medium expression of reflexive processes causes sufficiently high interest of students in the content of the study.

The key indicator influencing the state of tranquillity is the regulatory characteristic of metacognitive involvement in the activity ($p < 0.006$, f -Fisher = 5,800). It is noted that the severity of all substructures of the state of tranquillity increases with the growth of involvement in metacognitive processes. However, the intensity of the content characteristics of calmness is not the same. The most optimal for educational activity is a high level of metacognitive involvement in a state of tranquillity, since in this case the highest productivity of mental processes is established with comparatively low indices of experience.

To determine the degree of influence of reflection on various substructures of cognitive states, the method of "polar groups" was applied. ISO for each of the substructures of the states is presented in Table 01.

Table 01. Indexes of structural organization (ISO) of mental states of interest and tranquillity

Components of the mental state structure / ISO	Interest	Tranquillity
Mental processes	4	3
Physiological responses	0	0
Experiences	1	4
Behaviour	5	13

As shown in Table 01, a higher ISO is noted for a state of tranquillity than interest. This difference is achieved due to the numerous interrelationships of various indicators of reflection with indicators of behaviour in a state of tranquillity, which is not observed in the state of interest. In both cases, behavioural characteristics are leading in the structure of mental states. Thus, the typical states for daily

activities are most intensively experienced in the case of an average level of cognitive reflection and high regulative reflection.

The influence of reflection on mental states in the intense activity of students (examination). Based on the research, it was established that the "typical" states in the stressful situations of exams are states of "concentration" and "depression". The indicated states are experienced in 53% of cases during the students' exam.

Based on the division of the students' general sample into groups, on their levels of reflection, it was found that the number of people experiencing low levels of mental activity increases with the level of reflexivity. So, about 45% of high reflexive students experience low-intensity states, while among the low-reflective such states are much less experienced – 28%. This indicates that this situation is most peculiar to low reflexive students, who are not able to analyse events and their internal experiences, and, consequently, not able to stop these experiences from "sinking" into negative states. At the same time, in the low reflexive levels, there are higher percentages of people experiencing states of increased activity (about 18%), and with increased reflexivity, this percentage decreases. It was also found that during exams, students are less likely to experience optimal states (mobilization, concentration).

The results of the research showed that the average reflection of current activity in a stressful situation determines the increase in the intensity of mental states of low activity and, at the same time, causes a decrease in the intensity of high activity states. Extremely low intensity indicators characterize the state of depression experienced by low- and high reflexive students, since the former are not aware of the current activity, they are not able to regulate it, and the latter, pay all their attention to this awareness, plunging deeply into it. This is because the process of self-control, aimed at one phenomenon, reduces self-control in another sphere.

In addition, it was revealed that the "most sensitive" tension of educational activity is "experiencing", as a component of the mental state. The significance of indicators of "experience" in a tense situation can be judged from the indexes of structural organization of depression and concentration states, presented in Table 02.

Table 02. Indexes of structure organization (ISO) of mental states of depression and concentration

Components of the mental state structure / ISO	Depression	Concentration
Mental processes	0	0
Physiological responses	8	3
Experiences	8	2
Behaviour	4	3

Attention is drawn to the fact that the state of depression is more closely connected with cognitive and regulative indicators of reflection than concentration (24 versus 12). This difference was formed due to the high organization of the structures of "experience" and "physiological reactions", which turn out to be eminent in a tense situation. In the state of depression, cognitive and regulative characteristics of reflection relate to experiences, while in the state of concentration no specific structures were identified. All this means that "experiences" in interrelation with reflection takes a leading role.

To establish the cumulative effect of reflection, the subject's regulatory abilities, and the forms of educational activity (Picture 1) on substructures of cognitive states, the obtained data were introduced into the model of variance analysis. The isolated model is statistically significant at the level of $p < 0.001$, which is an extremely high index, and accounts for 34% of the variance of the mental states' mean values. Statistically significant (according to the F-criterion of Fisher) are the influences exerted by the form of learning ($p < 0.001$), the level of regulatory abilities ($p < 0.001$), and the reflection of activity ($p = 0.05$). In accordance with the presentation of Karpov, "reflection of activity" can be attributed to cognitive characteristics of reflection, while the level of regulatory abilities to its regulatory indicator. The latter allowed to establish the cumulative influence of various components of reflection on the cognitive state of students. Interaction of variables "reflection of activity" and forms of educational activity ($p < 0.004$) demonstrates high influences on the intensity of students' experiences.

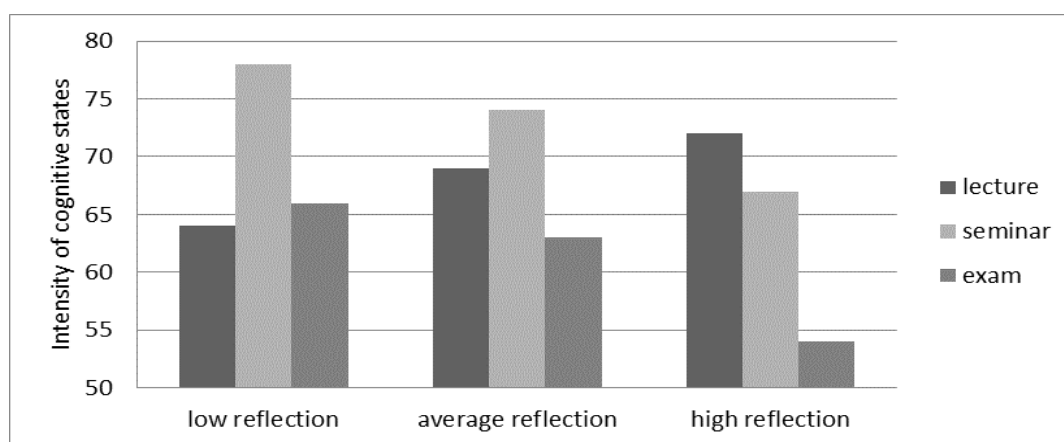


Figure 01. Influence of reflection on mental states depending on the form of educational activity

An unexplained part of the dispersion may be associated with the influence on the cognitive states of various personality traits. The obtained results indicate that the correlation between the characteristics of states and reflection is complex and mediated by the form of educational activity. As was established earlier by Karpov, reflexivity, as a psychological property, without directly affecting certain mental phenomena, can become a "transformer of basic primary laws" (2005). This is clearly demonstrated in the study.

It can be concluded that students with the same level of regulatory abilities and reflection reach the most intensive cognitive states: with high regulatory ability and high reflection, and with low regulatory ability and low level of reflection. In general, a decrease in the level of regulatory abilities with high reflection is an important condition for reducing the intensity of experiences. Thus, the key indicator influencing cognitive states is the level of the subject's regulatory abilities, and reflection performs a transforming function, strengthening or weakening these relations.

7. Conclusion

1. The typical states for daily activities (interest, tranquillity) are most intensively experienced in the case of an average level of cognitive reflection and high indicators of regulatory reflection. It was found that low and high reflexive students experience more cognitive states of high intensity. The leading component of mental states is characteristic of "behaviour".

2. It has been established that in a tense situation high reflexive students more often experience low-intensity cognitive states, while low reflexive students experience both high and low intensity mental states. The leading element of the structure of cognitive states is "experience".

3. It is shown that the influence of reflection on cognitive states is mediated by the level of the subject's regulatory abilities: people with the same level of regulatory abilities and reflection reach the most intensive cognitive states: with high regulatory ability and high reflection, with low regulatory ability and low level of reflection. The key indicator influencing cognitive states is the level of the subject's regulatory abilities, and reflection performs a transformational function.

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