ASTRONOMY: RESEARCH METHODS OF TEACHING. M.V. Proshletsova\textsuperscript{1} and N.I. Perov\textsuperscript{2}, \textsuperscript{1,2}Astronomical Observatory, State Pedagogical University, Respublikanskaya, 108, Yaroslavl 150000, Russian Federation. E-mail: perov@yspu.yar.ru

“Learning becomes education in itself only after achieving of superior field of science, entering into the world of idea and bringing of this idea about reason and heart of man. Only at this scientific stage and not at school one, the science acquires of moral strength.” – K.D. Ushinsky.

Introduction: The analysis of the well-known general-educational programme of studying of astronomy and physics makes draw a conclusion – the teacher play a role of transmitter and controller of knowledge of pupils at the low level of their work without assistance. Modern investigation in astronomy teaching pay attention the pupils and the students may perform scientifically significant astronomical discoveries and astronomy is one of school subjects (with little exception) that give lucky chance to study exclusively basing on research methods \cite{1, 2, 3}. Such situation is explained by small number (~10000) of professional astronomers on the Earth and astronomical numbers of astronomical objects (the Galaxy consists of \(10^{11}\) stars and there are \(10^{12-13}\) unidentified comet’s nuclei in the Solar system).

The “Standard” Methods And Forms of Efficiency Teaching: The “standard” methods and forms of efficiency teaching: are stated in the monograph \cite{4}: a) various ways of development of logical structure of a subject; b) application of multiform of visual aids; c) use of problem teaching for formation of creative thinking; d) independent compiling of school problems by pupils; e) acquaint students with the individual-differential training; f) a composite use of technical means of training; g) application of group study; h) introduce of systems of control for lessons; i) enlist students and pupils for research work, which is significant means for development of their creative potential (but this form of teaching often considers scientific discoveries of pupils which are significant only for themselves). The efficiency of all these methods and organization forms of teaching of pupils and students are determined by psychological training, pedagogical mastership of a teacher (an instructor) and specify of the subject \cite{5}. The cooperative way of a pupil and the teacher for the truth is presented in pedagogical literature from epoches of Confucius, Lomonosov, and Tsilokovsky to our day. This turn of cognition of nature is known now as pedagogic of co-operation \cite{4}.

The Methods of Organization of Scientific-Research Work of Students: One of the attempts to elucidate the methods of organization of scientific-research work of students in astronomy was undertaken in the monograph Paley A.B \cite{1}. It is stressed in the paper of \cite{6} there are three aspects of creative activities: combinative creation (to create the novelty based on the combinations of the well-known thesis); innovatory creation (to bring new before unknown elements); research creation (to originate a new method of approach or an idea). All these aspects of creative activities we use for forming of professional qualities and creative powers of pupils and students. The process of organizing of the collective activities embraces: projecting of aims and purposes; prognosis of results; selection of participants; co-ordination and amending of their actions; assessing of the results. These factors are taken into consideration at forming of creative groups of young astronomers. In the process of guidance of the students and the pupils, who take an active part in significance astronomical scientific research, we pay attention the mechanisms of their socialization; a) education (rational knowledge about the world); b) enlightenment (self- development, self-education); c) breeding (cultural of orations, politeness in daily round); d) traditions (cultural experience of social being); e) religion (it removes psychological frustration in connection with inexplicability of many aspects of life by rational way); f) art (it implements, like religion, psychological-compensating functions and expands enumeration of real or invented social collisions being before man). Auspicious conditions for organizing of significance scientific astronomical research of students (pupils) are in universities (schools) where instructors (teachers) are active working and who are astronomers as well as pedagogues \cite{1, 3}. Matters very much for accomplishing of scientific discoveries by students and pupils are modern computers and free access to bases of data and automatically telescopes using INTERNET. The important condition of success of scientific – research work of students and pupils is creative cooperation with the representatives of astronomical and others scientific societies, whose interests lie in the field of cosmic research. In this case the broad choice of topics of investigation is opened. These topics are experimental, observable, and theoretical or based on the numerical experiments and stochastic investigations, putting systematization of the known knowledge; forecasting of new astronomical phenomenon and discoveries of unidentified celestial bodies. We consider the statistic experiments in astronomy as a perspective direction of organizing of scientific research work of students of universities and pupils of the secondary school. We mark the classical form of scientific work of students and pupils like scientific observations at astronomical
observatories, optical and radar station (searching for comets and asteroids, investigation of variable stars, study of physical nature of the Sun, the Moon, planets, and interstellar matter, exploration of the near Earth expanses, based on the observation of the artificial satellites of the Earth).