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AMBIENT TEACHING – LEARNING ENVIRONMENT FOR GIFTED STUDENTS IN CHEMISTRY

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ABSTRACT

Establishing a learning environment for gifted students is of great importance since it should encompass the development of their interpersonal skills, social responsibility and enable effective delivery of teaching instructions (Miedijensky, 2018). Contrary to traditional school learning through the adoption of final products of scientific research, ambient teaching is offering high degree of adoption of a scientific way of thinking and engagement of students, starting from observational procedures, to extracting and collection of materials (Lehrer, & Schauble, 2006). Our study aimed to explore the gifted students' perceptions regarding the ambient teaching as a model for learning environment. 24 gifted students from elementary schools in Kragujevac attended at the workshop in the laboratory at the Faculty of Science. The workshop was dedicated to the basic principles and laboratory operations and equipment, while problems were carefully designed to meet the cognitive needs of gifted students. Interview was used as instrument for delineation of the gifted students' perceptions regarding the ambient teaching. According to the results, majority of the students confirmed the significance and suitability of the ambient teaching for the learning chemistry as school subject, as well as they considered this way of learning more interesting than traditional method used in schools.

Keywords: gifted students; chemistry, ambient teaching; workshop.

INTRODUCTION

Establishing an adequate learning environment for gifted students is of great importance since it should encompass the development of their interpersonal and technical skills, social responsibility and enable effective delivery of appropriate teaching instructions (Miedijensky, 2018). Under the circumstances of educational system reforms and fast changes at the global level, the current school shouldn't be only transmitters of the knowledge, but also constructive and transformative educational institution able to accept changes in the society and technology and outgrow its own educational frame (Anđelković, & Stanisavljević-Petrović, 2011). There is a special need for the establishment of the connections between school and their environments and inclusion of school activities in this process, particularly in the part of contextualization of the process of learning and teaching (Stanisavljevic-Petrovic, 2014). For these reasons, the institutions such as galleries, factories, museums, botanical gardens and research centres have become important resources for the formal education since they have great possibilities for the realization of teaching and learning process and acquiring the school knowledge through the experiential learning. In addition, the realization of teaching activities in different environs enables building the knowledge by means of the direct contact with the object of knowledge. Contrary to traditional school learning through the adoption of final products of scientific research, the characteristics of ambient teaching is a high degree of adoption of a scientific way of thinking and engagement of students, starting from observational research procedures, to extracting and collection of materials. The ambient teaching is encompassing the building of the knowledge through the active relationship with physical and social environment. The environment chosen is the one that

contribute to the achievement of the goals set in front of the participants group, and, in the same time, environment that provides all necessary elements included in the learning content. From the perspective of gifted students' educational needs, it is important to emphasize that this type of teaching could enable developments of problem-solving skills and encourage the use of critical thinking and creative research (Rahm, 2002; Reid, 2002). Although this concept of the learning has appeared recently in the literature (De Zan, 2005), its roots are present much longer in pedagogical practice. Still, the routine of performing the school activities outside the classroom is not sufficiently present in the Serbian education system, according to the some examples described in literature (Đokić Ostojić, 2011; Janković, 2009).

From the other hand, learning chemistry contents through the laboratory activities is very important since it makes bridges between theoretical and practical application in science teaching (Minner et al., 2010), and enables the acquiring the knowledge through the learning by inquiry. Although the laboratory activities could be a challenge for most of the pupils, the benefits for the gifted students are reflected in the increase of ability for identifying the problem, making hypotheses, gathering and analysing of data, making conclusions, as well as in assessing their own progress in this environment. However, the high cost of chemicals, not adequately equipped school laboratories, or in some cases, complete absence of school cabinets for experimental work joined with potential dangers of chemicals, are still major obstacles for the frequent application of laboratory activities not only in Serbian education system, but much wider (Scalise et al., 2011).

Herein, we present the results of our study aimed to explore the gifted students' perceptions regarding the ambient teaching as a model for learning environment of gifted students. Therefore, 24 gifted students from elementary schools in Kragujevac (Serbia) attended at the workshop organized in the laboratory at the Faculty of Science. The workshop was dedicated to the basic chemical principles and laboratory operations and equipment, and the problems and tasks were carefully designed to meet the cognitive needs of gifted students. Interview was used as an information extraction procedure to delineate the gifted students' perceptions regarding the ambient teaching. According to the results obtained, majority of the students confirmed the significance and suitability of the ambient teaching for the learning chemistry as school subject, as well as they considered this way of learning more interesting than traditional method used in school system.

MATERIAL AND METHODS OF WORK

Participants

The study was conducted with 24 gifted eight-grade pupils from the elementary schools from the territory of Kragujevac city (Serbia). The students were chosen by the chemistry teachers based on their personal engagement in the classes, grades, but also taking into consideration the recommendations from peers, parents and school pedagogues. The workshop was organized at the chemical laboratory in Institute for Chemistry (Faculty of Science, University of Kragujevac, Serbia). The laboratory is fully equipped with all necessary apparatus and chemicals, as well as with fume hood and safety closets. The workshop was organized by the professors, assistants and young PhD students who had a long-year experience in science teaching, application of STEM activities with school children and organization of different types of workshops. The workshop was organized around the basic chemical equipment and operations, such as: filtration, determination of solubility of organic compounds, titrations, distillation, accurate volume measuring, determination of pH, preparation of different solutions. Prior to the realization of workshop, the participants were equipped with the theoretical knowledge about the studied chemistry concepts. To encourage the students to adopt higher level approaches for learning chemistry in laboratory and think critically, the problems and tasks were designed in that way to introduce the chemical concepts by the inquire-based learning approach. Interview as qualitative research technique was used for the delivery of open-asked questions for the conversation of the participants and collection of data about subject of research.

RESULTS AND DISCUSSION

The list of the interview questions is given in the Figure 1.

Interview Questionnaire	
Q1	How often do you have opportunity to attend the classes form the school subjects outside the classroom?
Q2	What has been working in groups in lab?
Q3	According to your opinion, what are the major obstacles for the learning chemistry concepts?
Q4	List the reasons you think that performing chemical classes in laboratory is/isn't usefully in school practice?
Q5	What skills do you think you gained through the laboratory experience?
Q6	After the realization of workshop, do you think that you have bigger ability and confidence to perform laboratory activities?
Q7	How often do you have opportunity to perform laboratory activities in the chemistry classes?
Q8	Will you recommend this way of learning of chemistry as a practice that should be used more often in the regular schools?

Figure 1. Interview Questionnaire.

Regarding the first question Q1, the majority of the students answered that they do not have often opportunity to study school subjects outside the classroom. Apart from the periodical visits to the some institutions (1 or 2 times per year), such as museums, the majority of the school classes are still organized in the school environment. Quite similar situation was observed in the students' answers to the Q7. Only small number (3 participants) of the students have answered that they had opportunity to perform laboratory activities even after each chemistry unit implying the use of those activities. Some of the answers have indicated that schools are not adequately equipped for the realization of this type of teaching. Regarding the question 3 Q3, the answers mostly refer on the absence of practical activities in the laboratory and the abstract nature of the chemical concepts. Considering the fact that respondents were gifted students, some of them also mentioned that during the regular classes they fill bored and that they need more challenging problems to solve and to connect knowledge with real-life contents. Although the majority of the students have answered that they consider the laboratory activities helpful for adoption of chemical knowledge, some of them mentioned that laboratory activities require extra time and, in some cases, merely following of lab procedures (question No 4). The list of the reasons supporting the use of lab activities as a way for learning chemistry is mainly consisted from: labs related adequately to the theoretical frameworks; students like hands-on activities and opportunity to visualize the chemistry contents; the acquired skills are useful and learning in this way is providing studding in more deep way then in the regular classes. The answers on the question 5 were diverse, from the ability to operate with some apparatus (for example, distillation), the ability to choose proper way for the separation of some of the liquid and solid substances to the measuring the substances and making differently concentrated solutions, etc. Almost all students have answered that they found the work in laboratory interesting and that this way of learning provide bigger ability and confidence for performing laboratory activities (Question 6), but some of the answers also referred that students still have fear from the work in laboratory. However, they also claimed that fear was overcome by the performing the activities in the small groups and therefore, we believe that this was one of the reasons that all students have agreed that they like team work and working in groups (Question 2). In addition, some of the students mentioned that they also filed uncomfortable at the beginning of the workshop, since the students didn't know each other before the realization of workshop. According to the students' opinions, the realization of the workshop has influenced increase of their confidence in the performing practical laboratory operations. The answers on the final question have served us to estimate the students' attitudes and reflection about the ambient teaching of the chemistry, its usefulness and relation to the traditional school classes. Majority of

the students confirmed the significance and suitability of the ambient teaching for the learning chemistry as school subject, as well as they considered this way of learning more interesting than traditional method used in school system. The feedback we obtained in this study has helped us to assess whether or not the developed workshop and laboratory program was effective in the meeting the educative needs of gifted students in chemistry, taking into consideration that learning outcomes depends not only on learning approaches but also on students' perceptions of the learning environment.

CONCLUSIONS

Our study aimed to explore the gifted students' perceptions regarding the ambient teaching as a model for learning environment. 24 gifted students from elementary schools in Kragujevac attended at the workshop in the laboratory at the Faculty of Science. The workshop was dedicated to the basic principles and laboratory operations and equipment, while problems were carefully designed to meet the cognitive needs of gifted students. Interview was used as instrument for delineation of the gifted students' perceptions regarding the ambient teaching. According to the results, majority of the students confirmed the significance and suitability of the ambient teaching for the learning chemistry as school subject, as well as they considered this way of learning more interesting than traditional method used in schools.

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