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The Impact of Selected School Experiments on Pupils' Attitudes Toward Chemistry

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Abstract: School experiments, as a teaching method, represent one of the visual ways of explaining relevant natural phenomena to pupils. The application of experiments in chemistry teaching is often interpreted as an excellent way to achieve good learning outcomes. The impact of conducted school experiments on pupils was examined using psychological instruments, administered before and after performing the selected school experiments in front of the pupils. Feedback from 143 respondents, pupils from primary and secondary schools in Bosnia and Herzegovina, was collected. Adequate statistical analysis was performed. Two key measures were identified: Affinity towards Chemistry and positive experiment experience. A slight but significant increase in the affinity scores was noted after demonstrating school experiments, showing a mildly positive impact on students' attitudes toward chemistry. Positive Experiment Experience scores were high, indicating a favorable perception of the demonstrations. The data suggest that students' initial affinity towards chemistry is the best predictor of their attitudes after the experiment, suggesting that pre-existing attitudes are key. No evidence was found for a "magic" intervention that significantly changes students' affinity. These findings highlight the importance of continuous engagement over isolated demonstrations, which alone cannot replace the impact of ongoing work with students.

INTRODUCTION

In recent years, chemistry education in Bosnia and Herzegovina has encountered a range of systemic challenges, including outdated curricula, inadequate laboratory infrastructure, and limited opportunities for professional development among teachers. Compared to neighboring countries such as Croatia, Serbia, and Slovenia, BiH has made slower progress in adopting modern, inquiry-based approaches and integrating digital tools into science and chemistry teaching (Agency for Pre-primary, Primary and Secondary Education of BiH, 2019). Chemistry teaching often presents educators with certain challenges that require innovative approaches compared to traditional teaching methods (Hajrić et al., 2012). Regional studies indicate that both elementary and high school pupils often perceive themselves as least efficient in mastering chemistry (Brković et al. 1998). Experts often emphasize the importance of practical experiments in chemistry education and their potential to enhance pupils' engagement with the subject (Hofstein & Lunetta, 2004).

Despite the recognized benefits of school experiments, research on how selected school experiments affect pupils' affinities toward chemistry remains limited in Bosnia and Herzegovina. The lack of relevant studies makes effective lesson planning for chemistry teachers challenging and disrupts a comprehensive understanding of educational phenomena in the region. This study aims to address how selected school experiments affect pupils' affinities toward chemistry. We seek to investigate how these experiments influence pupils' overall attitudes and affinity towards chemistry, contributing to both educational practice and theory in Bosnia and Herzegovina. The primary goal of research is to measure the impact of selected school experiments on pupils' attitudes towards chemistry. More specifically, the general aim of the research is to investigate the extent to which the selected school experiments influence changes in pupils' overall attitudes and affinities towards chemistry.

MATERIALS AND METHODS

Adequate school experiments were selected for demonstration based on the specific criteria. The selected school experiments needed to be short, cost-effective, and safe for both pupils and the experimenter. They also had to demonstrate a chemical change in a way that the audience could easily observe and understand. Additionally, experiments should effectively demonstrate chemical changes, emphasizing visual indicators such as color changes or other relevant stimuli. The following school experiments were chosen for research: Red Cabbage Anthocyanin Extract as a pH Indicator, Neutralization of Hydrochloric Acid Using Antacid and The Effect of Reactant Concentration and the Presence of a Catalyst on the Rate of a Chemical Reaction.

Prior to the demonstration, the substances used in the first experiment were prepared: Anthocyanin Extract (solution prepared by soaking shredded red cabbage in warm water at 40°C, concentration unknown, 100 *mL* prepared), Hydrochloric Acid (c=1 *mol/dm³*, V=20 *mL*), Acetic Acid (aqueous solution, c=1 *mol/dm³*, V=20 *mL*), Sodium Bicarbonate (aqueous diluted solution, V=20 *mL*), Sodium Hypochlorite (aqueous diluted solution, V=20 *mL*), Sodium Hydroxide (aqueous diluted solution, V=20 *mL*), and Distilled Water. For the second experiment, the substances used were: Anthocyanin Extract (solution prepared as described above, 100 *mL* prepared), Hydrochloric Acid (c=0.1 *mol/dm³*), and an antacid of choice (granules based on a basic substance). In the third experiment, the substances used were: Hydrochloric Acid (two solutions, c=0.1 *mol/dm³* and c=1 *mol/dm³*), Calcium Carbonate, Manganese IV Oxide, and Hydrogen Peroxide. Standard Laboratory Equipment was used for preparing these school experiments. Preparation of experiments is done in a previously established order: First, preparation of required solutions is conducted using a standard laboratory procedure. Following that, laboratory glassware is strategically positioned with prepared solutions, equipment, and schemes related to color-pH changes. After the preparation, participants were allowed to enter the laboratory where school experiments would be demonstrated. After the preparation, participants were allowed to enter the laboratory where school experiments were demonstrated. Psychological measuring instruments were chosen and designed to evaluate the possible impact of selected school experiments on pupils' attitudes toward chemistry. The appropriate instruments were selected. CAEQ questionnaire on attitudes and experiences with chemistry (Coll et al., 2002), an adapted translation from Cvjetković's (2019) research, was picked for the research. The selected instrument contains items on a seven-point scale, where the endpoints are defined as "1 = harmful to people" and "7 = beneficial to people", with intermediate values (2 to 6) representing varying degrees between these two extremes. The following instruments were designed: A constructed scale was used with items rated on a five-point Likert scale, where response options ranged from 1 = not true, 2 = somewhat true, 3 = moderately true, 4 = mostly true, to 5 = completely true., designed for measurement affinities and attitudes towards chemistry before and after the demonstration of selected school experiments. Also, evaluation sheets are designed to measure the experience of experiments after each of the three demonstration chemical reactions. Each of the three evaluation sheets contains three five-point Likert scale items, with responses ranging from "1=not true" to "5=completely true". The purpose of the selected instruments was to verify the reliability and validity of the designed instruments. Research is done in the predetermined order.

After the preparation, participants were introduced to the laboratory. Distribution of sheets with psychological instruments to participants was conducted. After that, clear instructions were given to participants regarding questionnaire filling. Participants were instructed to fill out the first questionnaire related to pupils' attitudes towards chemistry before the demonstration of selected school experiments. After that, the experimenter started the demonstration of the first selected school experiment, Red Cabbage Anthocyanin Extract as a pH Indicator.

During the first experiment, pupils were shown how Anthocyanin Extract changes color based on the pH of the tested substance. After the experiment demonstration, participants were asked to fill out the second questionnaire related to measuring the experience of the first selected school experiment. For the next two experiments, the procedure is similar and includes the demonstration of selected school experiments and filling out the questionnaire related to measuring the experience of the specifically selected school experiment.

During the second experiment, pupils were shown how the color of the indicator, in our case, Anthocyanin Extract, changes during the neutralization process.

In the third experiment, pupils were shown how a different concentration of hydrochloric acid affects the rate of the chemical reaction in a way that is easily visible to participants. This is achieved by positioning the rubber balloons on the Erlenmeyer flasks where the reactions are taking place, at the same time. Pupils noticed a difference in the level of inflation of the rubber balloon since more carbon dioxide will be produced in the reaction with a higher concentration of the reactant, hydrochloric acid. It is also shown how manganese(IV)-oxide affects the rate of the hydrogen-peroxide composition: the reaction is vigorous. After the demonstration of all three experiments, participants were instructed to fill out the last questionnaire related to measuring their attitudes towards chemistry after the demonstration of selected school experiments. In the end, the experimenter thanked the pupils for participating and gave them appropriate gifts. After the research procedure, filled instruments were properly labeled, statistically processed, and stored. Several methods and analyses were used in the research:

Exploratory Factor Analysis (EFA)

Used to explore the latent structure of attitudes towards chemistry and the intensity of experiment experiences.

Parallel Analysis

Utilized to determine the number of factors to retain based on eigenvalues extracted from actual data compared to random data.

Confirmatory Factor Analysis (CFA)
Employed to confirm the factor structure identified through EFA.

Bivariate Correlation Analysis
Conducted to assess relationships between variables such as Affinity towards Chemistry and experiment experiences.

Linear Regression Analysis
Used to predict Affinity towards Chemistry scores after experiments using predictors like Positive Experiences of Experiments.

Moderation Analysis
Applied to explore if certain variables, such as school level (elementary vs. high school), moderated the relationships between experiment experiences and Affinity towards Chemistry.

Mediation Analysis
Examined to understand the indirect effects of experiment experiences on Affinity towards Chemistry through potential mediators. These methods collectively provided insights into the structure of attitudes towards chemistry, the impact of experiment experiences, and how these relationships varied across different groups of students.

RESULTS AND DISSCUSION

Feedback from 143 participants, pupils from primary and secondary schools in Bosnia and Herzegovina, was collected. The sample included 143 students from primary (N=74, or 52%) and secondary (N=69, or 48%) schools, of which 66% (N=95) were girls and 34% (N=48) were boys. A prerequisite for the main analyses necessary to achieve the research goals was the determination of the dimensionality and the justification of the scoring method for the dependent variable, in this case, the students' attitudes and affinities towards chemistry. Nine items measuring attitudes towards chemistry were subjected to exploratory factor analysis (EFA) (JASP Team, 2024), separately for the measurements before and after the experiments were conducted. The factor analysis was based on a matrix of polychoric correlations and the minimum rank factor analysis (MRFA) extraction method. The parallel analysis procedure, which is recommended for selecting the optimal number of factors to retain and is based on comparing factor eigenvalues from the actual correlation matrix with simulated values (Subotić, 2013), suggested retaining one latent factor in both cases (Table 1). This factor had a functionally identical vector structure (congruence coefficient of $\varphi \approx 1.00$; Lorenzo-Seva & Ten Berge, 2006), and was named Affinity towards Chemistry. In both cases, the factor explained over 50% of the common variance of the items (with two-thirds of factor loadings exceeding .71, which is conventionally considered the threshold for excellent loadings; Tabachnick & Fidell, 2013, p. 702) and had relatively high reliability (internal consistency). These findings justify the use of a single general score for students' attitudes and affinity towards chemistry and allow for a direct comparison of this measure before and after the experiments.

The latent structure and convergent validity of the measure of attitudes toward chemistry were examined. The summative scores of the Affinity towards the Chemistry dimension indicate an average expression slightly above the theoretical scale mean of 3.0, both for the measurement before ($t(142)=5.41$, $p<.001$, $d=0.45$) and after ($t(142)=6.24$, $p<.001$, $d=0.52$) the experiments demonstration in front of the pupils.

Table 1: Exploratory factor analysis of attitudes towards chemistry

No	Items	Factor Saturations	
		Λ_{before}	Λ_{after}
7.	I like chemistry.	.91	.94
2.	I would gladly volunteer to participate in chemistry lab experiments.	.84	.86
3.	I enjoy lab work.	.80	.82
1.	I would be happy to study chemistry.	.80	.83
6.	I want to conduct chemistry experiments in the future.	.78	.80
4.	Attending lab experiments motivates me to independently search for more information about chemistry online.	.71	.78
5.	Chemistry is useful in everyday life.	.53	.61
9.	Learning chemistry is difficult. (R)	.52	.58
8.	I will need chemistry for further education.	.51	.57
	Characteristic Root	4.97	5.46
	% of Explained Common Variance	50.7	56.6
	McDonald's ω (reliability)	.87	.90
	M (summative scores)	3.40	3.49
	SD (summative scores)	0.88	0.94

For convergent validation of the measures used, i.e., verifying their correlation with other similar measures, the summative scores of the Affinity towards Chemistry dimension (before and after the experiments) were correlated with the total summative score of selected subscales from the CAEQ questionnaire of attitudes and experiences with chemistry (Coll et al., 2002). The correlations are shown in Table 2. Firstly, it can be observed that the correlations between the scores of Affinity towards Chemistry before and after the experiments are very high. Squaring the obtained correlation coefficient indicates that initial and outcome attitudes toward chemistry share approximately 83% of the variability. In the context of the convergent validity of these scores, it can be noted that they are related to CAEQ scores to a relatively high extent of around .6, sharing 32% and 40% of variability with them, respectively. This, combined with previously demonstrated clear unidimensional factor structure and a good level of reliability, supports the justification for using the Affinity towards Chemistry scores to test the main hypotheses of the study.

Table 2. Correlations of Affinity towards Chemistry Dimension with CAEQ Score

Variables	(1)	(2)	(3)
(1) CAEQ	1.00		
(2) Affinity for Chemistry – before experiments	.57	1.00	
(3) Affinity for Chemistry – after experiments	.63	.91	1.00

Note: All correlations are statistically significant at p<.001.

Additionally, the latent structure and intensity of experiences during experiments were examined. Exploratory factor analysis was conducted on three items related to the experience of each experiment, separately for each of the three presented demonstration experiments. The technical specifications of the procedure were identical to those used for analyzing Affinity towards Chemistry. In the case of experiences during all three experiments, it was justified to aggregate all three items into a single dimension (Table 3), with adequate reliability and explaining approximately 50-60% of the common variance of the items. The factor exhibited functional equivalence, with congruence coefficients of $\varphi \geq .98$. This dimension was labeled as Positive Experience of Experimentation, primarily determining interest, followed by comprehensibility, and to a lesser extent, the perceived usefulness of the experiment.

The summative scores for experiences across all three experiments were nearly identical and indicated a relatively high level of positivity in the experiences. The experiences from all three experiments were relatively highly correlated: $r_{E1\sim E2}=.61$, $r_{E1\sim E3}=.58$, $r_{E2\sim E3}=.52$ (all $p<.001$).

Table 3. Factor Structures of Experiences in Three Experiments

No.	Items	Factor Saturations		
		Λ_{E1}	Λ_{E2}	Λ_{E3}
3	This experiment is interesting to me.	>.99	>.99	.96
1	I can understand this experiment.	.67	.68	.77
2	I learned something useful from this experiment.	.35	.58	.60
	Characteristic Root	1.76	2.01	2.19
	% of Explained Common Variance	49.9	57.5	62.5
	McDonald's ω (reliability)	.79	.80	.78
	M (summative scores)	4.33	4.33	4.32
	SD (summative scores)	0.73	0.76	0.81

Experiences across all three experiments show low to moderate bivariate correlations with Affinity towards Chemistry scores, ranging from .28 to .40 (Table 4). Positive Experience in Experiment 3 is the most strongly associated with Affinity towards Chemistry—both before and after the experiments.

Table 4. Bivariate Correlation of Experiment Experiences with Affinity towards Chemistry

Variables	Affinity for Chemistry before experiment	Affinity for Chemistry after experiment
Positive Experience E1	.28	.29
Positive Experience E2	.30	.35
Positive Experience E3	.40	.39

Note: All correlations are statistically significant at p<.001.

Additional insight into the level of experience in each experiment was gained through responses to open-ended questions, from which appropriate categories were coded. The frequency of these categories is shown in Table 5. These categories indicate a more pronounced differentiation in the experiences of the experiments compared to the summative scores of assessments. Specifically, Experiment 2 is characterized as somewhat more useful in daily life, with respondents noting that they learned more new things compared to the other two experiments. Experiment 3 is described as more enjoyable/interesting than the other two.

Table 5. Frequency of Categories Based on Open-Ended Responses

Category	Experiment	Frequency of Response	
		Frequency	%
Something new was learned.	E1	17	12
	E2	27	19
	E3	18	13
Nothing particularly new was learned.	E1	9	06
	E2	8	06
	E3	4	03
The experiment was interesting, fun, or enjoyable.	E1	53	37
	E2	53	37
	E3	75	52
The experiment was not interesting, fun, or enjoyable.	E1	15	10
	E2	15	10
	E3	13	09
The knowledge demonstrated by the experiment is useful for everyday life.	E1	3	02
	E2	32	22
	E3	4	03

Regarding changes in attitudes towards chemistry after the experiments, the Affinity towards Chemistry scores were statistically significantly higher after conducting the three experiments ($M=3.49$, $SD=0.94$), compared to the initial scores before the experiments ($M=3.40$, $SD=0.88$): $F(1, 142)=7.67$, $p=.006$, $\eta^2=.051$. The magnitude of change was very low, with scores increasing by $\Delta M=0.09$, corresponding to a change of just over a quarter of a standard deviation ($d=0.23$), or approximately 5% of the score variance attributable to the experiments. At the level of individual items, the most notable effects were observed in the increase of average scores for the statements: "I want to conduct chemical experiments in the future." (M_after=3.47 > M_before=3.20; t(142)=-3.40, p<.001, d=-0.28) and: "I would be glad to study chemistry." (M_after=2.67 > M_before=2.43; t(142)=-3.09, p=.002, d=-0.26). When considering the participants' school levels (primary vs. secondary), there was a significant interaction with changes in Affinity towards Chemistry scores: F(1, 141)=4.61, p=.033, η^2=.002, suggesting a larger increase in scores among primary school students (ΔM=0.16) compared to secondary school students, where the increase was functionally marginal (ΔM=0.02). However, introducing this interaction of changes in Affinity towards Chemistry scores in relation to school level and exposure to experiments explains only about 0.2% of the variance in scores across the total sample, while the main effect of experiment exposure additionally explains another 0.2% of the variance (F(1, 141)=7.44, p=.007, η^2=.002). When analyses are purposefully conducted separately on subsamples of primary and secondary school students, a significant effect is found in the primary school subgroup: F(1, 73)=10.33, p=.002, η^2=.124, suggesting an increase in Affinity towards Chemistry scores, with a change size of approximately d=0.37 standard deviations, or about 12.4% of explained variance. The effect on the secondary school subgroup is not significant, suggesting functionally identical Affinity towards Chemistry scores before and after the experiments: F(1, 68)=0.21, p=.652, η^2=.003, indicating a change in scores of only d=0.05 standard deviations, or just 0.3% of explained variance attributable to the presentation of experiments to students. From the obtained low but significant acute changes towards increased Affinity towards Chemistry, attributed to the presented experiments, it is not possible to determine which individual experiment is responsible or to what extent each is responsible for the score changes. This can only be indirectly tested by examining how the introduction of experiences from each experiment affects the outcome scores of Affinity towards Chemistry. Including these individual experiment experiences in the model shows that, in competition with the other two experiments, only the Positive Experience of Experiment 3 (E3) achieves a significant positive contribution to Affinity towards Chemistry scores, explaining about 2.4% of the variance: F(1, 139)=10.67, p=.001, η^2=.024. The effects (statistically non-significant) of experiences from the other two experiments are F(1, 139)<0.001, p=.986, η^2<.001 for E1 and: F(1, 139)=2.77, p=.098, η^2=.006 for E2. The effect of E3 experience persists even when including the school level of participants in the model, reducing the percentage of explained variance from 2.4% to 1.9%: F(1, 138)=10.68, p=.001, η^2=.019. Due to the observed trend of differences in changes in Affinity towards Chemistry scores depending on whether the participant is in primary or secondary school, as well as the established primary relevance of Experiment 3 experiences in explaining changes in affinities, additional regression-moderation-mediation analyses were conducted to gain deeper insight into the obtained statistical trends.

Firstly, it was checked whether the bivariate correlation between Affinity towards Chemistry scores before and after the experiments (r=.91, p<.001) significantly differed among primary (r=.89, p<.001) versus secondary school students (r=.92, p<.001). The difference between these two correlation coefficients was not statistically significant: Δr=-.03, Δp=.375. Additionally, this relationship did not significantly differ based on the Positivity of the experience of any of the three experiments, regardless of whether the participants were primary or secondary school students. Thus, the experiences of the experiments themselves and the interactions between the experiences of the experiments and the school level of the participants did not statistically moderate this relationship. Next, it was examined to what extent the Positive Experience of each of the three experiments uniquely predicted Affinity towards Chemistry scores after conducting the experiments. This was done using linear regression analysis, conducted without (Table 6, Step 1) and with control for initial Affinity towards Chemistry scores (Table 6, Step 2).

Table 6. Positive Experiences of Experiments as Predictors of Affinity towards Chemistry after experiments.

Steps	Predictors	Criterion: Affinity for Chemistry after experiments	
		β	*p*
Step 1: R_1^2=.161	Positive Experience E1	-.002	.989
	Positive Experience E2	.20	.046
	Positive Experience E3	.28	.004
Step 2: R_2^2=.826 (ΔR^2=.647, Δp<.001)	Positive Experience E1	-.01	.897
	Positive Experience E2	.09	.044
	Positive Experience E3	-.02	.725
	Affinity for Chemistry before experiment	.89	<.001

In the first step, when only Positive Experiences of experiments are considered as predictors, it is possible to explain 16.1% of the variance in Affinity towards Chemistry after Experiment, where Experiments 3 and 2 make statistically significant contributions, without a relative contribution from Experiment 1. None of these correlations were statistically moderated by the school level of the participants, meaning that regression correlations did not significantly differ based on whether the participant was in primary or secondary school (E1: Δβ=.02, Δp=.974; E2: Δβ=.33, Δp=.113; E1: Δβ=.09, Δp=.674). However, although the difference between the heights of these regression correlations was not statistically significant, the relationship between the Positive Experience of Experiment 2 and Affinity towards Chemistry after Experiment was slightly higher and statistically significant only in the case of primary school students: βE2; Primary=.37, p=.002, compared to the coefficient obtained for the secondary school subgroup, which was not statistically significant: βE2; Secondary=.04, p=.829. In the second step, when the initial level of Affinity towards Chemistry is included in addition to the experiences of the three experiments, the prediction of Affinity towards Chemistry after experiments increases to as much as 82.6% (with a statistically significant increase in prediction compared to the first step of 64.7%), while the partial contributions of Experiments 1 and 3 disappear, and only a minor relative contribution of the Positivity of Experiment 2 remains statistically significant. This suggests that the best predictor of Affinity towards Chemistry after experiments is the intensity with which Affinity entered, and that, beyond this, only to a lesser extent, how positively they experienced E2 additionally predicts an increase in initial Affinity scores towards chemistry. None of these regression correlations was statistically moderated by the school level of students.

The change in relative contributions of experiment experiences in predicting Affinity towards Chemistry after experiments was also considered in relation to categories of experiment experiences obtained from open-ended responses. In no case was any statistically significant moderation effect obtained (for categories where the prerequisites for these analyses were met).

CONCLUSION

The results of the analysis of responses from 143 elementary and high school students in Bosnia and Herzegovina have been presented. Two distinct measures were identified: Affinity towards Chemistry and Positive Experiment Experience. A slight but statistically significant increase in Affinity toward Chemistry scores was observed after demonstrating school experiments to students, indicating that conducting selected demonstration experiments has a mildly positive impact on students' attitudes (affinity) towards chemistry. Scores for Positive Experiment Experience were relatively high, suggesting a positive perception of the experiment demonstrations themselves. The effect of increasing Affinity toward Chemistry scores was primarily localized to elementary school students, with no statistical significance observed among high school students. It was inconclusive which experiment had the greatest impact on the slight increase in Affinity towards Chemistry scores, although there are indications that the third experiment, involving the effect of solution concentration and catalyst presence on the speed of chemical reactions, had the most significant influence. Additionally, the second experiment, neutralizing hydrochloric acid using antacids, showed a significant indication of increasing Affinity towards Chemistry. The first experiment could potentially be omitted from the demonstration without a significant impact on students' affinity toward chemistry. Experiment experiences approximate the direct effect of experiments. The data suggest that the best predictor of Affinity towards Chemistry after the experiment is the intensity of affinity with which students entered, indicating that students' pre-existing attitudes best predict their attitudes after viewing selected school experiments. The existence of a "magic" short intervention or shortcut that fundamentally changes students' affinity towards chemistry was not confirmed. The above findings underscore the importance of continuity in teachers' work. It is noted that isolated demonstrations do not have as intense an effect as continuity in working with students. It is concluded that demonstrating school experiments as an isolated component cannot substitute for continuity in working with students. Given the nature and complexity of chemistry as a science, demonstration experiments represent an indispensable teaching method in modern education. The research has shown a mild positive impact of selected school experiments on students' affinity toward chemistry. The degree of confirmation of the hypothesis is low. Certain indications and dilemmas have emerged, which can serve as topics for future research aimed at improving educational processes and chemistry teaching. The method of demonstrating and presenting school experiments alone is not powerful enough to significantly influence students' affinity towards chemistry. Isolated demonstrations of school experiments to students cannot replace continuous teacher-student interaction.

To increase students' interest in chemistry, demonstration experiments should be incorporated as part of a sustained and comprehensive teaching approach rather than isolated activities. Future efforts should emphasize continuous teacher-student interaction, the selection of engaging and relevant experiments, the development of supportive instructional materials, and the provision of professional training for teachers to deliver effective and stimulating demonstrations. Additionally, creating a positive classroom atmosphere where students feel encouraged to participate is crucial for maintaining and enhancing students' enthusiasm for chemistry.

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Summary/Sažetak

Školski eksperimenti, kao nastavna metoda, predstavljaju jedan od vizuelnih načina objašnjavanja relevantnih prirodnih pojava učenicima. Primjena eksperimenata u nastavi hemije često se tumači kao izuzetno efikasan način za postizanje dobrih ishoda učenja. Uticaj izvođenja školskih eksperimenata na učenike ispitan je primjenom psiholoških instrumenata, koji su primijenjeni prije i nakon izvođenja odabranih školskih eksperimenata pred učenicima. Prikupljeni su odgovori 143 ispitanika – učenika osnovnih i srednjih škola u Bosni i Hercegovini. Izvršena je odgovarajuća statistička analiza. Identifikovane su dvije ključne mjere: afinitet prema hemiji i pozitivno iskustvo s eksperimentima. Zabilježen je blag, ali statistički značajan porast rezultata afiniteta prema hemiji nakon demonstracije školskih eksperimenata, što ukazuje na umjereno pozitivan uticaj na stavove učenika prema hemiji. Rezultati pozitivnog iskustva s eksperimentima bili su visoki, što ukazuje na pozitivnu percepciju demonstracija. Podaci sugerišu da je početni afinitet učenika prema hemiji najbolji prediktor njihovih stavova nakon izvođenja eksperimenata, što ukazuje na to da su prethodno formirani stavovi od ključnog značaja. Nisu pronađeni dokazi o postojanju „magične“ intervencije koja bi značajno promijenila sklonost učenika prema hemiji. Ovi rezultati naglašavaju značaj kontinuiranog angažmana u radu s učenicima, jer pojedinačne demonstracije same po sebi ne mogu zamijeniti efekat dugotrajnog i sistematskog rada s učenicima.