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Out-of-School Learning and Students' Motivation

Marek Skoršepa, Jarmila Kmeťová, Ahmet İlhan Şen

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Abstract

Out-of-school learning has been reviewed (Şen, A. İ. et al., 2021) as a promising way of teaching Science actively due to its ability to provide students with first-hand experience. Another driving force of education is motivation. It can stimulate a considerable part of students' abilities and help lead to achieving desired educational aims. In this contribution, we provide partial results of evaluating students' motivational orientation concerning learning in out-of-school settings. The background for the study is an Erasmus+ project, where partners from four countries (Turkey, Slovakia, Czechia and Germany) aimed to develop an out-of-school learning curriculum for teacher training study programmes. Herein, we present the Slovak motivation data gained while performing and evaluating two specific activities proposed for the following out-of-school setting: (i) education in the pharmacy and (ii) education in the distillery (Skoršepa et al., 2022). The research includes data from 152 grammar school students (average age M = 15.76). The renowned psychological tools MSLQ and IMI were used to measure students' motivation.

Keywords

out-of-school learning, motivation, motivated strategies for learning questionnaire (MSLQ), intrinsic motivation inventory (IMI)

Introduction and framework

Motivation is a phenomenon that accompanies any human activity, including education. It has the power to stimulate a considerable part of students' abilities and help lead to achieving desired educational aims. Several teaching/learning approaches can support the influence of motivation on education. One of them is Out-of-School Learning, which has been reviewed (Şen, A. İ. et al., 2021) as a promising way of teaching Science actively due to its ability to provide students with first-hand experience. Our study provides partial results of evaluating students' motivational orientation concerning learning in out-of-school settings. The background for the study was platformed by the Erasmus+ project (2019-1-TR01-KA203-074692, acronym: DOSLECTEP), where partners

from four countries (Turkey, Slovakia, Czechia and Germany) developed an out-of-school learning curriculum for teacher training study programmes. In this contribution, we present the Slovak part of the research – the motivation data gained while performing and evaluating two specific activities proposed for the following out-of-school setting: (i) education in the pharmacy and (ii) education in the distillery (Skoršepa et al., 2022).

The primary goal of this part of the research was to determine the level of students' motivational orientation related to education outside the school, which means education implemented in an out-of-school environment. The additional questions were: Are there measurable factors affecting students' motivational levels related to out-of-school education? How can the influence of these factors (if any) be explained and interpreted? Is the motivation, for example, influenced by gender, age (or year of study/class), a specific activity or even the school the student attends? Is there a quantitative relationship between the students' motivational orientation levels before and after implementing activities in an out-of-school environment? Can we classify students according to their level of motivation to specific groups/clusters?

Methods

We monitored the level of students' motivational orientation based on implementing activities created for two specific out-of-school environments: (i) pharmacy and (ii) distillery. A total of 152 students from four Slovak grammar schools participated in the education (and research) (52 males, average age $M = 15.76$, $SD = 0.67$). All the participating students had yet to experience out-of-school learning. Table 1 shows the number of students from schools participating in given activities. In all schools, the 2nd year students implemented the training in the distillery, while the 3rd year students implemented pharmacy activity.

The research data necessary for the investigation and evaluation of students' motivational orientation during out-of-school education was collected utilizing two self-report measuring instruments (structured questionnaires), the first of which was administered to students before performing the education in an out-of-school environment (input measurement), and the second one after performing the education (output measurement). While administering the input research tool, the students were sufficiently familiar with the framework content of the subsequently implemented activities. After completing all educational activities, the output instrument was administered directly in an out-of-school environment. If some activities or interpreting the results and subsequent discussions needed to be completed after returning from the out-of-school environment, the output measuring tool was administered at the school.

Table 1. The number of students participating in the implementation of activities

School			Activity 1: Pharmacy	Activity 2: Distillery
1.	School 1	Class 1 (2nd year of study)	-	23
		Class 2 (2nd year of study)	-	24
		Class 3 (3rd year of study)	24	-
2.	School 2	Class 1 (3rd year of study)	23	-
3.	School 3	Class 1 (3rd year of study)	17	-
		Class 2 (3rd year of study)	18	-
4.	School 4	Class 1 (2nd year of study)	-	23
	N	**152**	**82**	**70**

As we specify later in the text, selected items and subscales of two renowned research tools used in psychological, pedagogical, and sociological practice were used to construct both instruments.

To prepare the input instrument, we used the motivation component of the well-known and widely used research scale Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich et al., 1991, 1993). The original self-report tool is extensive, containing 81 items that measure 15 different dimensions. However, not all of them are related to motivation: the instrument was developed to measure two related areas (sections): (i) motivation and (ii) learning strategies. In the tool, 6 subscales of 31 items were set aside to inspect the relevant dimensions of motivation. These mainly reveal and assess the student's goals, perceived value orientation resulting from the activity, and the level of his/her perceived skills necessary for successfully implementing the given educational activity. It should be noted that the term "activity", as understood by the MSLQ authors, has a broader meaning, considered not only a specific activity but also a course or a lesson.

In our research, we monitored four of the six MSLQ dimensions of motivation: (i) intrinsic goal orientation (pre1), (ii) extrinsic goal orientation (pre2), (iii) self-efficacy for learning and performance (pre3) and (iv) control of learning beliefs (pro4). Therefore, we extracted four corresponding subscales to measure these dimensions, and in each of them, we selected four related items. Thus, our input tool consists of 16 items belonging to four subscales. The original wording of the items was transformed (in the Slovak language) according to the specific requirements and conditions of the current research.

We also used the proven instrument - Intrinsic Motivation Inventory (IMI) (McAuley et al., 1989) to construct the output tool. IMI is most often defined as a multidimensional tool to assess the subjective experience related to a particular target activity while mainly monitoring the level of intrinsic motivation and self-regulation (Skoršepa, 2015). Its original construction (Ryan, 1982) was gradually improved by other authors (Deci et al., 1994; Duda, 1992; Markland & Hardy, 1997; McAuley et al., 1991; Plant & Ryan, 1985; Whitehead & Corbin, 1991a, 1991b) up to the form that in the so-called the "full" version contains seven subscales of 45 items.

Similarly to the input measurement, for the output measurement, we chose to monitor the following four dimensions: (i) interest/pleasure (post1), (ii) perceived competence (post2), (iii) effort/importance (post3), and (iv) value/usefulness (post4). Again, we extracted four corresponding subscales and four items belonging to them from the IMI for measuring these dimensions. Thus, the output measure consists of 16 items belonging to four subscales. The original wording of the items was transformed into the Slovak language.

Results

Based on the inspection, we can reveal the students' overall motivational orientation in the individual dimensions of motivation. The mean values of the motivation score recorded before and after implementing the out-of-school education are presented in Figure 1 and Figure 2. It is obvious that the overall motivational level of the students is relatively high in both cases and, on average, at a higher intermediate level. The lowest average score of all eight observed dimensions was found in the extrinsic goal orientation (pre2) (4.50), which we consider natural in situations that induce truly effective motivating conditions for education because, with correctly set motivational elements of a potentially motivating educational environment, it is ideal if the intrinsic components of motivation prevail over the extrinsic ones.

It is optimistic that the dimensions contributing to intrinsic motivation (especially those measured by output measurement) are at a high level. The highest value was recorded in interest/enjoyment (post1) (6.11), the dimension considered an intrinsic motivation assessor, and even a self-reported measure of intrinsic motivation. These results clearly support educational activities carried out in out-of-school settings.

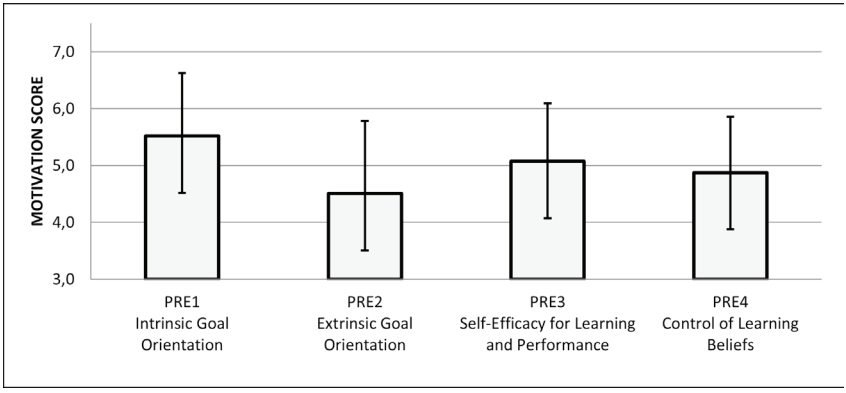

Figure 1. The overall students' motivational orientation BEFORE implementing the activity (mean score value)

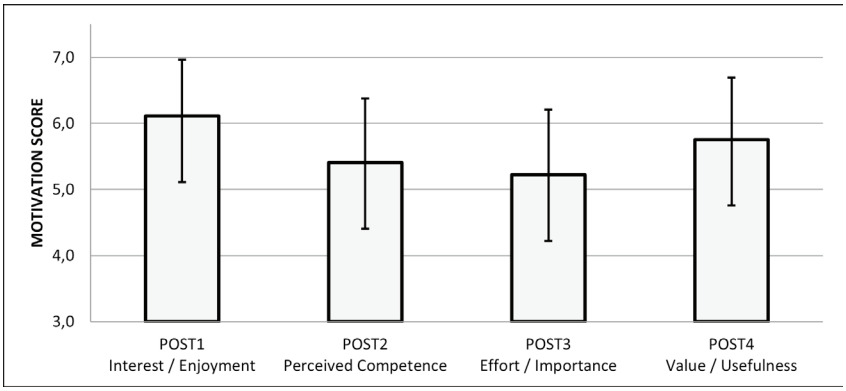

Figure 2. The overall students' motivational orientation AFTER implementing the activity (mean score value)

Various factors always determine the level of motivational orientation and its dimensions. Our research considered gender, experimental activity, and school as potential effectors of students' motivational orientation. The following section shows the significance of the differences between different data sets in various monitored parameters (factors).

The results of the ANOVA analysis show that gender, as a factor, only partially affects the students' motivational orientation related to out-of-school learning. In both measurements, before and after the implementation of the activities, we found statistically significant differences between males and females in only one of the four subscales of the input measurement and one subscale of the output measurement. In the input measurement, this subscale was extrinsic goal orientation (pre2) ($F(1,150) = 5.887$; $p = 0.016$), and the comparison of mean score values depicts that female students show a higher level of extrinsic goal orientation compared to males ($M(m) = 4, 16$, $SD = 1.46$; $M(f) = 4.69$, $SD = 1.31$). In the output measure, there was noted a gender difference in the perceived competence subscale (post2) ($F(1,150) = 5.099$; $p = 0.025$), where males showed a higher mean score ($M(m) = 5.64$, $SD = 1.06$; $M(f) = 5.28$, $SD = 0.90$). In this case, it seems that males were more aware of their abilities to solve the given activities than females, or at least they declared their abilities more confidently. A comparison of the average motivation score of male and female students for all subscales of both measurements is presented in Figure 3 and Figure 4.

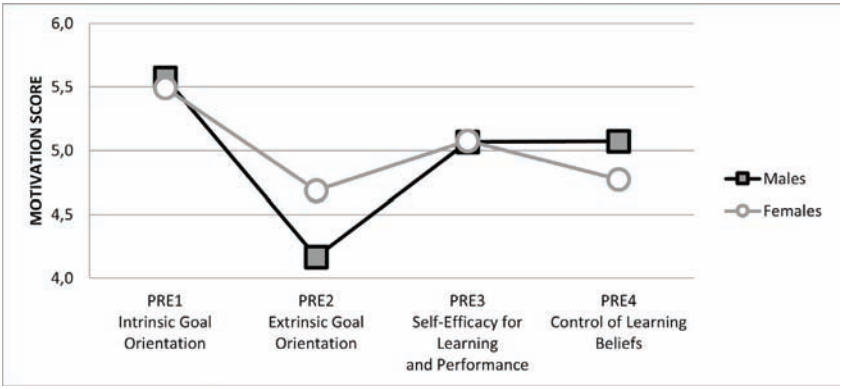

Figure 3. Differences in motivational orientation between male and female students BEFORE implementing the activities

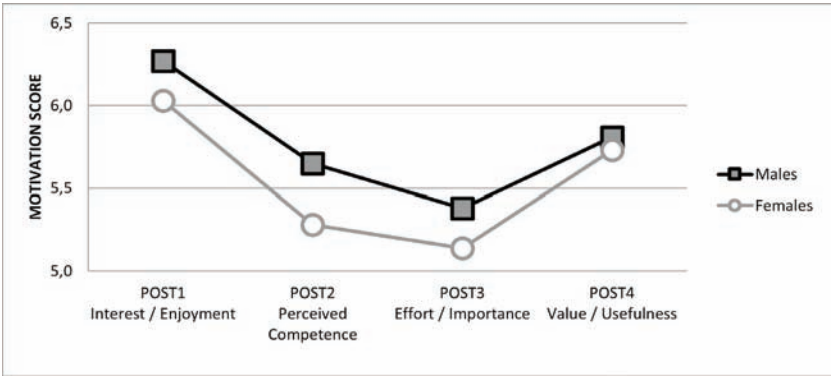

Figure 4. Differences in motivational orientation between male and female students AFTER implementing the activities

Since students from four schools participated in implementing the activities, the school itself can be considered a potential effector of the students' motivational orientation level. The school creates a particular physical and mental background (educational climate) for the student, which can manifest in different ways during education in out-of-school environments. Therefore, we considered it interesting to find out whether the school can function as a factor generating differences in students' motivational orientations. The results showed that students attending different schools were significantly differently motivated in only one subscale of the input measurement: intrinsic goal orientation (pre1) ($F(3,148) = 3.298$, $p = 0.022$). We did not notice significant differences between students from different schools in the other subscales of the input measurement and none of the output

measurement subscales. Therefore, it is evident that the students' intrinsic motivation can be related to the different platforms from which they come. In Figure 5, we compare the average motivational scores of students from different schools achieved in the input investigation.

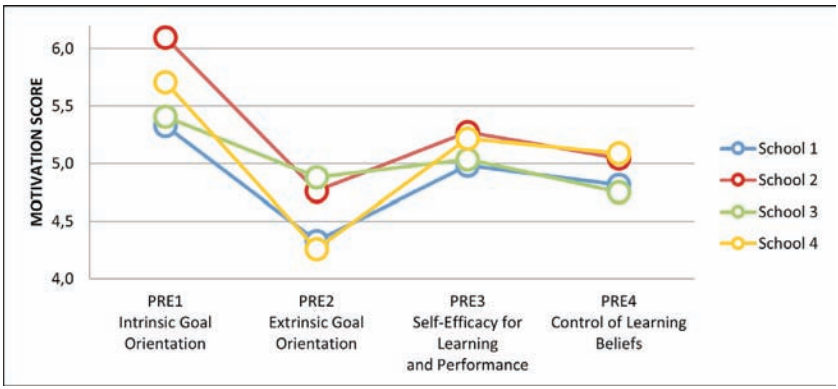

Figure 5. Differences in motivational orientations generated by students of different schools BEFORE implementing the activity (mean score values)

We also looked for the origin of possible significant differences between the activities and, simultaneously, between different years of study since students of different years carried out different activities. However, we did not identify significant differences in any of the monitored subscales generated by this factor (activity, grade).

The determined motivational scores can also be used to classify students according to their motivational preferences in the measured dimensions and to organize them into specific groups. For this purpose, we used statistical methods of cluster analysis, where the mean (average) values of the motivation score for the subscales were used as input data, which means that the scores in individual items were not considered. The statistical analysis was done in two steps: (i) hierarchical cluster analysis and (ii) non-hierarchical cluster analysis.

In the hierarchical approach, we used Ward's method of agglomerative clustering (Ward, 1963), and subsequently, mainly based on graphic representations of its results in the icicle plots, scree plots (Figure 6 and Figure 7) and dendrograms, decided the number of clusters that were taken into account in the subsequent non-hierarchical procedure. The outcomes of the hierarchical cluster analysis showed that the participating students could be arranged into four reasonable clusters based on the results of the input measurement and three clusters based on the output measurement result.

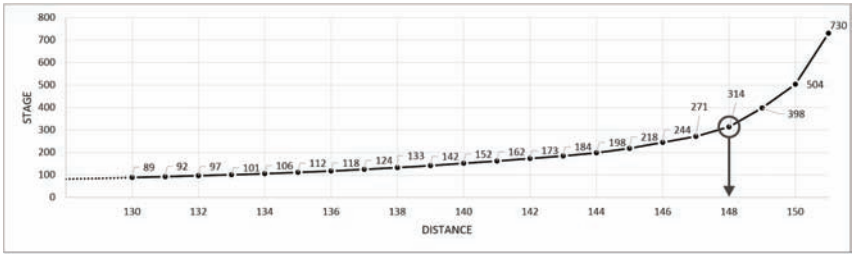

Figure 6. Scree plots for hierarchical cluster analysis BEFORE implementing the activities

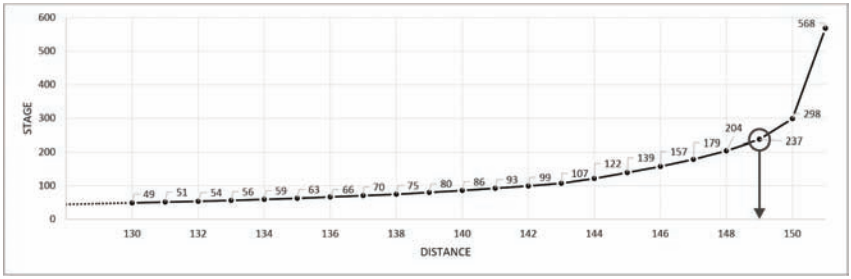

Figure 7. Scree plots for hierarchical cluster analysis AFTER implementing the activities

In the non-hierarchical statistical analysis, using the method of nearest centers (K-means), we obtained the final centers of the predicted clusters presented in Figure 8 and Figure 9.

Although agglomerative clustering using Ward's method tends to remove, and thus neglect, too small clusters (Kráľ et al., 2009), we noted them in both measurements. We believe it is right not to neglect these specific cases, even though they represent only a tiny part of the sample. If, for the non-hierarchical phase of the cluster analysis, we used, e.g., a smaller number of clusters, these specific cases would be "swallowed" by the larger generated clusters. Thus, they would not be detectable in the results at all.

It is interesting in the results from the input measurement (Figure 8) that while almost two-thirds (64%) of the students belonging to the joint group formed by the combination of cluster 3 (23%) and cluster 4 (41%), show a very high level of motivation orientations in the three dimensions of the input measurement (intrinsic goal orientation (prel), self-efficacy for learning and performance (pre3) and control of learning beliefs (pre4)), based on extrinsic goal orientation (pre2) they can be divided into two subgroups of unequal size: (i) two-thirds of the students with a high level of extrinsic motivation (cluster 4) and (ii) one-third of students with a medium level of extrinsic motivation (cluster 3). Cluster 1

represents students with a higher average level of motivation, with a motivational score ranging in all monitored dimensions from 4 to 5. The mentioned small group of students (5%) is represented by cluster 2, which includes students with evidently low motivation before implementing out-of-school activities, especially in intrinsic and extrinsic motivation. Paradoxically, their score in the self-efficacy for learning and performance (pre3) falls into the middle range.

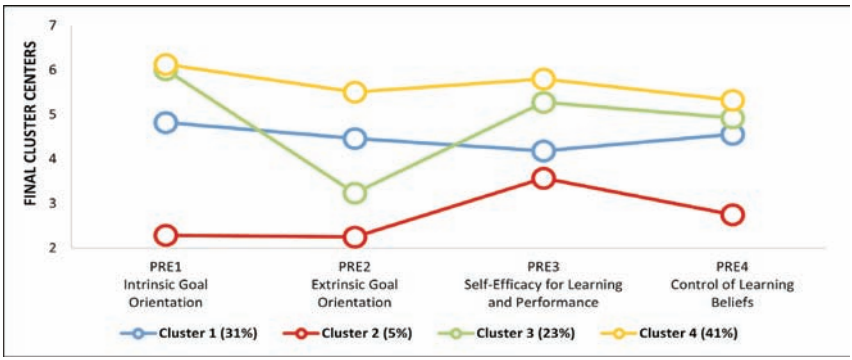

Figure 8. Final cluster centers for non-hierarchical cluster analysis BEFORE implementing the activities

It is clear from the output measurement results (Figure 9) that the stratification of students based on their level of motivational orientation after implementing out-of-school learning activities is much more apparent, more clearly defined and does not overlap. Almost all respondents show either a very high level of motivational orientation (72%), with a motivation score of 6 or more (cluster 2) or a higher medium level of motivational orientation (26%), with a motivation score in the range of 4 to 5 (cluster 1). It is a positive fact that we recorded only 2% of students (cluster 3) with a low motivational orientation after implementing the activities, but even then, only in the interest/enjoyment (post1) and value/usefulness (post4) dimensions. The other two dimensions of the output measurement show a motivation score at a medium (perceived competence (post2)) or lower medium (effort/importance (post3)) level.

The primary relations between the subscales of the same instrument, as well as the interconnectedness between the subscales of both instruments, can be revealed by correlation analysis. We implemented it using the average score for individual subscales. The results of the correlation analysis (Pearson's r correlation coefficients) are shown in the correlation matrix in Table 2. When evaluating the degree of correlation of our data, we start from the threshold values defined by Cohen (1988), who considers variables with a correlation coefficient (in absolute value) greater than 0.50 (that means $| r | > 0.50$) to be highly correlated. Such values are highlighted in grey in the correlation matrix.

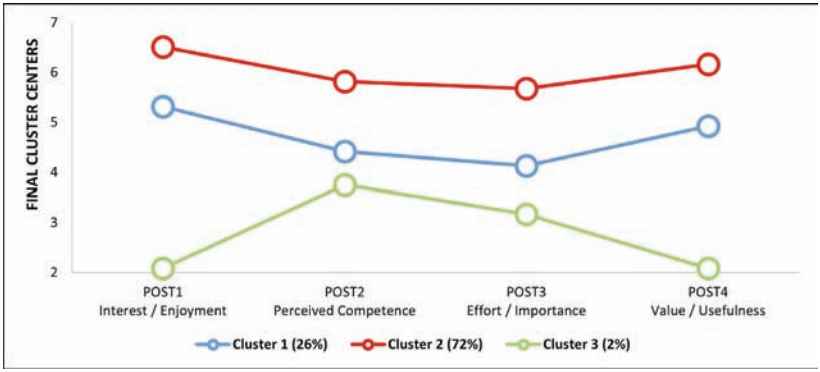

Figure 9. Final cluster centers for non-hierarchical cluster analysis AFTER implementing the activities

Table 2. Correlation matrix (r, Pearson) for all considered subscales of students' motivational orientation

Subscale	pre1	pre2	pre3	pre4	post1	post2	post3
pre2	.301**						
pre3	.581**	.356**					
pre4	.599**	.329**	.421**				
post1	.428**	.258**	.230**	.403**			
post2	.247**	.237**	.312**	.114**	.477**		
post3	.309**	.395**	.315**	.298**	.553**	.642**	
post4	.496**	.307**	.350**	.359**	.759**	.583**	.711**

** Correlation is significant at the 0.01 level (2-tailed).

From the obtained correlation matrix (Table 2), it is also apparent that both used instruments have different degrees of heterogeneity. Among the input measurement dimensions, only two highly correlated cases were recorded, related to intrinsic goal motivation (pre1), self-efficacy for learning and performance (pre3) and control of learning beliefs (pre4). On the other hand, as we mentioned above, the output measurement dimensions represent much more interconnected constructs since the highly correlated cases are, with a minor exception (but close to the threshold values), all of them. The other correlation coefficients (mainly in the input measurement) range from 0.114 to 0.496, which, according to Cohen (1988), declares a medium correlation level between the measured constructs. We also notice the interconnectedness of some subscales between the two instruments, where in some cases, correlations were achieved at least at a higher medium level ($r > 400$), even approaching the limit of high correlation (pre1 ↔ post4). Even though the dimensions show a natural connection, we expect to confirm this phenomenon, ideally through a higher correlation coefficient value. It is necessary to notice that the level of correlation between the subscales of the same instrument should not be unnaturally high because it may indicate insufficient independence of monitored constructs. The level of detected correlation should, therefore, be within reasonable intervals. In our case, we did not notice any

extremes that deviated from the confirmation of such natural relationships. At the same time, we confirm the logical assumption that the constructs measured by the subscales of the input instrument are significantly more independent than those measured by the output subscales. As has been mentioned several times, the output measurement is focused only on intrinsic motivation and its subdimensions, which means not on the aspects of motivation in a broader context, as measured by the input measuring instrument. This finding fully corresponds to the knowledge of the characteristics of the original instruments (MSLQ and IMI). Similar conclusions were reached in another study using the same tools in different contexts (Skoršepa, 2015).

Conclusions and implications

The study's findings in the field of students' motivational orientation can be summarized in the following conclusions. One of the fundamental resulting outputs is the confirmation that out-of-school learning undoubtedly has a high motivational potential for students. We found that the motivational scores of our respondents were at a higher average level in almost all of the observed dimensions of motivation (before and after implementing the activities). We also documented these conclusions with cluster statistical analysis, which showed that most respondents could be included in clusters representing moderately or highly motivated students. Based on our previous experience (Skoršepa, 2015; Skoršepa & Tortosa Moreno, 2014; Urban-Woldron et al., 2013), we assumed that various factors will determine the level of students' motivational orientation. However, it turned out that this is not so striking in the case of out-of-school learning (in contrast to our previous studies devoted to computer-supported experimentation). Indeed, only a slight statistically significant difference in the perception of several motivational dimensions generated by the different genders of the students was shown. However, it is optimistic that considering all dimensions of motivation, the relatively lowest average score was achieved in extrinsic motivation. We know that education in which the student is motivated by intrinsic stimuli is the most effective. At the same time, we allow ourselves to hope that a lower score in areas related to extrinsic motivation will somehow transform into a higher score in dimensions related to intrinsic motivation. Of course, it is rather challenging to identify specific elements that directly contribute to the motivational potential of education in an extracurricular environment. However, we believe the following contribute to this to the greatest extent. At the same time, the overall motivational effect probably arises from their mutual combination: (i) The out-of-school educational environment itself is motivating, which, regardless of its specification, has the potential to provide new and attractive stimuli that can increase the student's interest in education. (ii) A short-term absence from the school environment can also motivate the student to temporarily escape from everyday reality, an almost stereotypical educational process in a "notorious"

school environment. (iii) The educational activities or their framework and topics carried out as part of education in an out-of-school environment can also be motivating. (iv) Ways of education in an out-of-school environment, with more opportunities for the student's active participation in the learning process, can significantly attract and motivate. (v) One of the motivating elements can be the connectivity between the student's education and his previous everyday experience. The same findings were also recorded in other educational contexts (Borghi et al., 2001; Pintó et al., 2010; Skoršepa, 2015), while our conclusions only reaffirm that the same principles also apply to out-of-school learning. (vi) In out-of-school learning, more intensive opportunities to apply interdisciplinarity and STEM principles can also be motivating. We realize that looking at the same natural science objects, processes and phenomena through the eyes of different natural science disciplines can be much more beneficial for their understanding in broader contexts (Jones, 2010) than when observed in isolation, only within one of the disciplines. Education outside school desks creates an ideal environment for applying natural and unforced connections between relevant learning subjects and individual STEM dimensions (Hasanah, 2020; Pawilen & Yuzon, 2019; Stohlmann et al., 2012). Based on the relevant literature (Klaassen, 2018; Lam et al., 2014), we can even claim that the ideal educational "ecosystem" for the practical application of interdisciplinary relationships is mainly topics based on everyday life. Thus, it seems that several educational principles intersect in the concept of out-of-school learning, the effectiveness of which (if applied correctly) we do not doubt.

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Ethics Statement

The ethics committee confirmed to the corresponding author that this research did not require ethics approval because of the full anonymization of the publicly available data and because the data are not sensitive.

Conflicts of Interest

The authors declare no conflict of interest.

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