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Students' Intrinsic Motivation in the Context of Inquiry-Based Geography Instruction

Abstract

The main aim of the study was to determine whether the implementation of inquiry-based geography instruction had a positive effect on intrinsic motivation of lower secondary school students. A quasi-experimental design was employed, in which students attended both traditional and inquiry-based lessons. The research instrument was the standardised Intrinsic Motivation Inventory (IMI). The collected data were processed using the software R. The results revealed that inquiry-based instruction had a significantly positive effect on students' intrinsic motivation. This finding serves as an important argument for implementing inquiry-based elements in education – an approach emphasised in the new national curriculum in Slovakia.

Keywords: lower secondary education, inquiry-based learning, intrinsic motivation, IMI questionnaire, geography education.

Introduction

Contemporary requirements on education, based on current trends in pedagogical theory and practice, point to the need to support students' intrinsic motivation. Therefore, the presented study responds to the demand for research on the influence of various teaching strategies on students' intrinsic motivation. School geography has an important position in the education system. The educational field of Man and Society (including also Geography) of the current Slovak elementary education reform under preparation accentuates educational

goals focused on the design and application of methods and procedures for acquiring, analysing and interpreting information leading to solutions of various tasks, challenges, and problems. According to many researches (e. g. Sam, 2024), an effective strategy to meet these goals is the inquiry-based instruction (IBI). IBI is not only an activating teaching strategy, but also a comprehensive didactic approach based on the principles of constructivism.

We assume that students experience traditional (more transmissive) instruction and IBI differently. The main aim of the research was to find out whether the implementation of IBI in Geography within the programme *ExpEdition Try, Explore, Learn* influenced intrinsic motivation of 5th grade elementary school students. We consider this research important because intrinsic motivation is the key prerequisite for effective learning and interest in the subject Geography. Investigating IBI effects can therefore provide valuable insights into how to support students' motivation and improve the quality of instruction.

Motivation as the prerequisite of effective learning

Motivation is one of the key determinants of effective learning. It is essential that instruction takes place in a setting that supports it. Several authors from the fields of psychology, pedagogy and neuroscience identify a number of factors relating to intrinsic motivation influencing students' willingness to engage in educational activities (e. g. Ryan & Deci, 2020). These include e. g. cognitive curiosity (Shin et al., 2024), development of autonomy and the ability to self-regulate the learning process (Mendoza et al., 2023), acquisition of new skills, level of understanding the tasks, visible progress (Holte et al., 2020), experiencing success and positive emotions (Xie at al., 2025). The social context of learning is also of fundamental importance (Amri et al., 2024), and the possibility to work under the guidance of a teacher providing students support within the so-called proximal development zone (Jowett et al., 2023). Research (e. g. Baker et al., 2025) indicates that students' demotivation and boredom often stem from a discrepancy between school requirements and students' interests, experience or cognitive needs. Another problem also is that new information is often presented without context and connection to previous knowledge or contradicts what they already know.

More studies point to the close link between teaching strategies and the level of students' intrinsic motivation. E. g. Holte et al. (2020) highlight the importance of curiosity stimulation through activating tasks. More research confirms that IBI is an affective approach to intrinsic motivation and active

learning (Sam, 2024). Quantitative empirical research comparing the effectiveness of traditional instruction (TI) and IBI begins to appear about 1970-ties. A major review study by Minner et al. (2010) analysing 138 studies published between 1984 and 2002 identifies mostly a positive influence of IBI on students' activation and motivation. More recent research includes the study by Jurečková, Kmeťová & Skoršepa (2024) confirming that the implementation of IBI adds to increasing the durability of knowledge, developing cooperation, science skills and key competencies, forming positive attitudes and strengthening intrinsic motivation of students. Thus, IBI has demonstrable benefits (as well as certain risks). Our study extends this knowledge by investigation of a specific IBI form, designed within the programme *ExpEdition Try, Explore, Learn*. It is a comprehensive didactic approach based on the principles of constructivism. It makes extensive use of practical activities, real life situations and students' group work. It also emphasises cross-curricular connections between Geography and Biology.

Methods of research

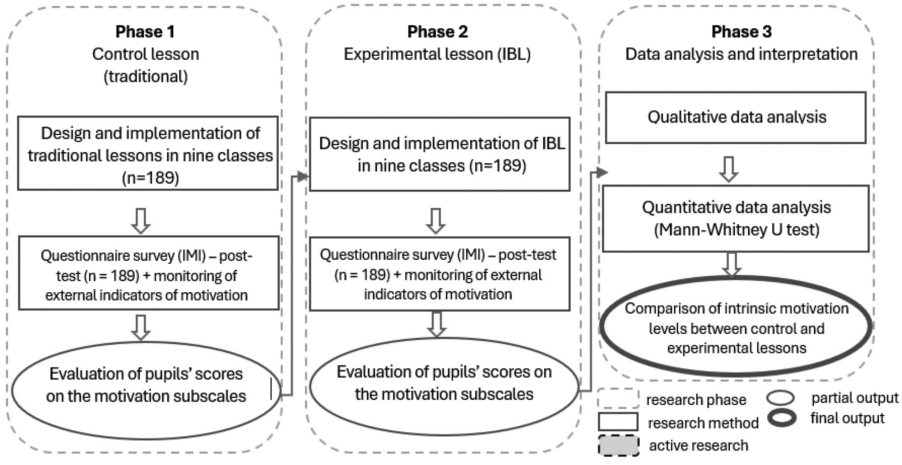
The main aim of our research was to find out whether the implementation of IBI in Geography within the programme *ExpEdition Try, Explore, Learn* influences intrinsic motivation of 5th grade elementary school students. We asked the research question: Does the implementation of IBI in Geography within the programme *ExpEdition Try, Explore, Learn* influence students' intrinsic motivation? The zero and alternative research hypotheses were formulated as follows:

H0: There is no statistically significant difference in the level of students' intrinsic motivation after IBI and TI in Geography.

H1: Students achieve a higher level of intrinsic motivation through IBI in Geography when compared with TI.

We also analysed the influence of IBI on specific sub-scales of intrinsic motivation and examined the relationships between them. The research was carried out using a quasi-experimental design (*posttest-only within class comparison*) (Pic. 1).

Pic. 1. Diagram of the methodological procedure used to identify the influence of IBI on students' intrinsic motivation



Research sample

The research sample consisted of 189 5th grade elementary school students (98 girls, 91 boys) at eight state elementary schools in Slovakia. Their average age was 11 years (mean 11.32; age range 10–12 years). The average number of students per class was 21. Respondents were selected by availability (convenience sampling). Each control (traditional) and experimental (IBI) lesson was attended by the same students. Data collection adhered to ethical research principles, with the principles of informed consent of students' legal representatives, anonymity, and voluntary participation respected.

Research tools and procedure

The research was conducted in three stages between 2021 and 2024 in nine 5th grade elementary school classes. Each class was taught two lessons with the same topic with an interval of a few days, both taught by the same teacher. The difference was only in the conception of instruction – the first lesson was taught the traditional way and was a control lesson, the second – inquiry lesson was an experimental lesson. The inquiry-based lessons were based on the textbook *ExpEdition Try, Explore, Learn 3*. Their contents followed up the traditional lessons, but their learning content and educational goals were not identical; they aimed rather at students' skill development. The topics were: Volcanic Activity, Glacial Activity, Rain Formation, Global Environmental Problems, Types of Countries on Earth, and Tourist Map.

We investigated whether students achieved higher levels of intrinsic motivation through IBI in Geography compared with the traditional method of instruction. To verify the hypothesis, the standardised IMI questionnaire (Gibson et al., 2024) was used, administered post measurement, i. e. after the traditional and inquiry-based lessons. Before use, the original questionnaire IMI, consisting of 54 items, was modified and abbreviated to final 15 items (Q 1 – 15), divided in six sub-scales reflecting comprehensively various aspects of students' intrinsic motivation: Interest/Enjoyment – Q1 *I enjoyed this lesson very much, Q2 I think the lesson was boring (R), Q3 I would describe this lesson as very interesting, Q4 During this lesson I was thinking about how much I enjoyed it;* Perceived Competence – *Q5 I think I was not very good at this lesson (R),Q6 I am satisfied with my performance during this lesson;* Effort/Importance *- Q7 I tried very hard at this lesson; Q8 – I did not try very hard at this lesson (R);* Perceived Choice – *Q9 I did the task at the lesson because I had to (R), Q 10 I did the task at the lesson because I wanted to*, Value/Usefulness – *Q 11 I believe the tasks at the lesson could be beneficial to me, Q 12 I think that this lesson helped me to understand the subject-matter better, Q 13 I think that the tasks were important to develop cooperation*; Pressure/Tension *Q 14 I was very relaxed at this lesson; Q 15 I felt tense at this lesson (R).* The reliability of the abbreviated IMI questionnaire was verified using Cronbach's alpha.

The questionnaire contained 15 randomly arranged statements to which respondents indicated their consents on a Likert scale from 1 (completely agree) to 6 (completely disagree). Students filled the questionnaires in directly after the lesson.

Analysis of data

All received and completely filled in questionnaires were included in the data analysis. The obtained data were processed in the statistical program R (R Core Team, 2021). Data cleaning included checking variable types for correctness and preparation for reverse coding of five reverse questionnaire items. Several descriptive statistics were used for basic characteristics of the data (relative frequencies, median, modus, etc.). Internal consistency of the questionnaire was assessed by Cronbach's alpha. Data distribution normality was determined by the Shapiro-Wilk test and visually by histograms and Q-Q graphs. As the data of either subscale did not meet the conditions of normal distribution ($W = 0.88$; 0.95, $p = 2.682\times10^{6}$; 6.264×10^{14}), the non-parametric Mann -Whitney U test was used to test the research hypothesis H1. In addition, the effect size was calculated, quantifying the strength of the relationship or the size of the difference between the control and experimental groups (Bhandari, 2023). The closeness

of the relationship between the variables was determined by Cohen's standard thresholds (Funder & Ozer, 2019).

Results of research

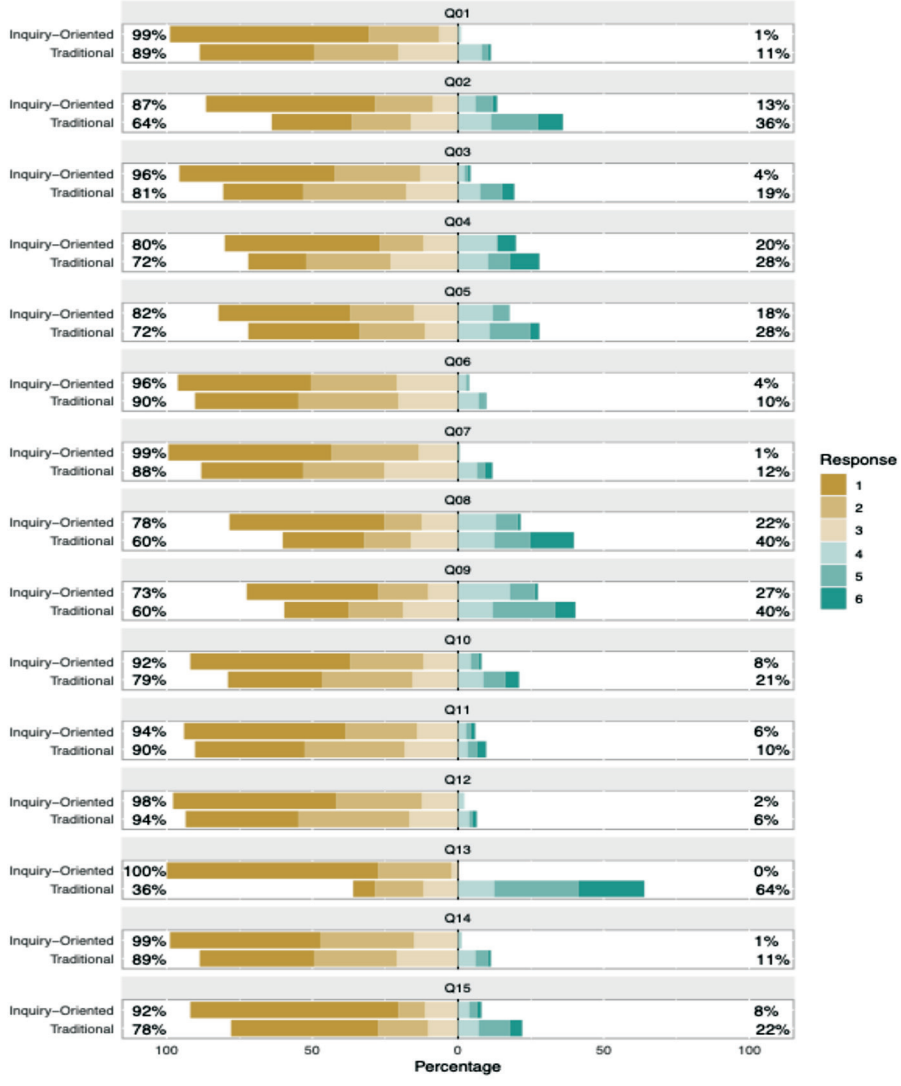
Traditional and inquiry-based Geography lessons were always attended and questionnaires filled in by the same students. The lessons were taught by the same teacher with the same topic, only the instruction conception was different. Thus there was a strong assumption that at the beginning of each lesson students had about the same motivation. Cronbach's alpha (α) for the whole

Table 1. Comparison of the results of the IMI questionnaire survey in traditional lessons (T; n = 189) and inquiry-based lessons (IBL; n = 189) in Geography in the questionnaire items (Q).

Variable	Median		Modus		Min.		Pctl. 25		Pctl. 75		Max.	
	T	IBL	T	IBL	T	IBL	T	IBL	T	IBL	T	IBL
Boys	51%	51%	–	–	–	–	–	–	–	–	–	–
Girls	49%	49%	–	–	–	–	–	–	–	–	–	–
Q 01	2	1	1	1	1	1	1	1	3	2	6	6
Q 02	3	1	1	1	1	1	1	1	4	2	6	4
Q 03	2	1	2	1	1	1	1	1	3	2	6	6
Q 04	3	1	2	1	1	1	2	1	4	3	6	6
Q 05	2	2	1	1	1	1	1	1	4	3	6	5
Q 06	2	2	1	1	1	1	1	1	3	2	6	6
Q 07	2	1	1	1	1	1	1	1	3	2	6	5
Q 08	3	1	1	1	1	1	1	1	5	3	6	6
Q 09	3	2	1	1	1	1	2	1	5	4	6	6
Q 10	2	1	1	1	1	1	1	1	3	2	6	6
Q 11	2	1	1	1	1	1	1	1	3	2	6	6
Q 12	2	1	1	1	1	1	1	1	2	2	6	4
Q 13	2	1	5	1	1	1	3	1	5	2	6	3
Q 14	2	1	1	1	1	1	1	1	3	2	6	5
Q 15	1	1	1	1	1	1	1	1	3	2	6	6

Note: Lower scores show higher levels of intrinsic motivation; T – traditional lessons, IBL – inquiry-based lessons; Q 1 – 15 – questionnaire items (explained in Methods of research)

Pic. 2. Comparison of the results of descriptive analysis of IMI questionnaire survey data (on a Likert scale 1–6) in traditional lessons (T; n = 189) and inquiry-based lessons (IBL; n = 189) in Geography



Note: Qs 1 – 15 are questionnaire items (explained in Methods of research)

data set was 0.75, corresponding to acceptable internal consistency of the questionnaire. The Value/Usefulness subscale achieved a lower value $\alpha = 0.52$ indicating a weaker internal consistency between its items. It might be caused by

the subscale containing questions aimed at two different dimensions: individual usefulness of the subject-matter and cooperation among students. In TI, students' answers to the question about cooperation (Q13) varied considerably, because in priority they did not work in groups, but some students nevertheless felt some cooperation – which increased the variability of responses and reduced the internal consistency of the subscale. The results of the data descriptive analysis are presented in Table 1 and Pic 2. Students achieved a higher level of intrinsic motivation in all questionnaire items for IBI. Students rated the development of cooperation (Q13), enjoyment of the lesson (Q1), their effort (Q7) and feeling relaxed during the lesson (Q14) most positively. The largest shift (mean difference 2.8 points) was recorded, as expected, in Q 13 – *I think that the tasks were important to develop cooperation*, as during IBI students worked in groups, but not so during TI. It was followed by Q3 – *I would describe this lesson as very interesting*, Q4 – *During this lesson I was thinking about how much I enjoyed it* and Q 9 – *I did the task at the lesson because I had to (R)* (mean difference 0.8 points). On the contrary, a smaller effect (mean difference 0.3 points) was recorded for Q6 – *I am satisfied with my performance during this lesson* and Q11 *I believe the tasks at the lesson could be beneficial to me*.

The results of IMI subscales are presented in Table 2 and Pic. 3. Students achieved lower scores in all subscales in IBI compared with TI in Geography, which means a higher level of intrinsic motivation. The most positive rating of IBI was in the subscale Value/Usefulness (median 1.3) assessing a perceived practical value of the activity and its usefulness in learning and in everyday life. Effort/Importance (median 1.5), assessing the effort and subjective importance of the activity for students, was also positively perceived in IBI. The results also indicate a low level of Pressure/Tension (median 1.5). The most marked difference between TI and IBI in Geography was in the Value/Usefulness subscale (difference 1.4 points); while the least difference was in the Perceived Competence subscale assessing how much students felt capable and competent to fulfil tasks.

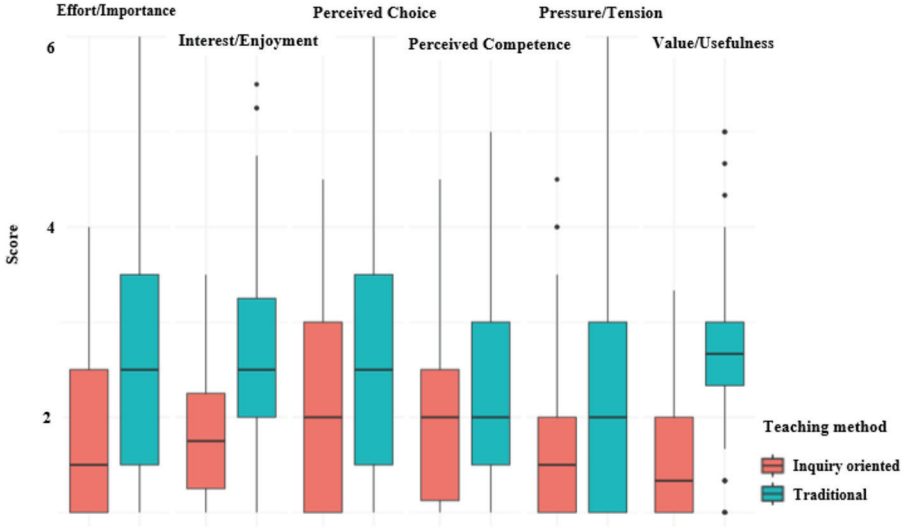
Table 2. Comparison of the results of descriptive analysis of the IMI questionnaire survey data in the intrinsic motivation subscales in traditional lessons (T; n = 189) and inquiry-based lessons (IBL; n = 189) in Geography.

Variable	Median		Modus		Min.		Pctl. 25		Pctl. 75		Max.	
	T	IBL	T	IBL	T	IBL	T	IBL	T	IBL	T	IBL
Effort/Importance	2.5	1.5	1.0	1.0	1	1	1.5	1.0	3.5	2.5	6.0	4.0
Interest/Enjoyment	2.5	1.8	1.5	1.0	1	1	2.0	1.2	3.2	2.2	5.5	3.5
Perceived Choice	2.5	2.0	1.0	1.0	1	1	1.5	1.0	3.5	3.0	6.0	4.5

Variable	Median		Modus		Min.		Pctl. 25		Pctl. 75		Max.	
	T	IBL	T	IBL	T	IBL	T	IBL	T	IBL	T	IBL
Perceived Competence	2.0	2.0	1.0	1.0	1	1	1.5	1.1	3.0	2.5	5.0	4.5
Pressure/Tension	2.0	1.5	1.0	1.0	1	1	1.0	1.0	3.0	2.0	6.0	4.5
Value/Usefulness	2.7	1.3	1.3	1.0	1	1	2.3	1.0	3.0	2.0	5.0	3.3

Note: Lower scores show higher level of intrinsic motivation; T - traditional lessons, IBL - inquiry-based lessons.

Pic. 3. Graphic presentation of data distribution in intrinsic motivation subscales between groups with traditional lessons and inquiry-based lessons in Geography (n = 372)



Note: Lower scores show higher level of intrinsic motivation

To verify the hypothesis H1, the results of descriptive analysis were compared with the results of the Mann-Whitney U test at the level of $p < 0.05$. There were statistically significant differences between the control and experimental groups in favour of IBI in all subscales ($p < 0.05$) (Tab. 3). For large research sets ($n_1 = n_2 = 186$), the critical value for $\alpha = 0.05$ lies in the interval $U \leq 14{,}650$ or $U \geq 19{,}928$. The calculated U values for the subscales fell in this interval therefore the zero hypothesis was rejected and the hypothesis H1 – *Students' intrinsic motivation to achieve a higher level through IBI in Geography when compared with TI* – was confirmed. The largest effect was in the subscales Value/Usefulness ($r = 0.66$) and Interest/Enjoyment ($r = 0.43$). Other effects

were small to medium in size. The smallest effect was in the subscales Pressure/Tension (r = 0.23) and Perceived Competence (r = 0.15, which is likely related to students' limited experience with IBI and group work. IBI within the programme *ExpEdition - Try, Explore, Learn* had a positive influence on intrinsic motivation compared with TI in Geography.

Table 3. Comparison of the Mann-Whitney U test results in the IMI subscales between the groups with traditional and inquiry-based Geography lessons (n = 372).

Subscale	Mann-Whitney U	r (Z /√N)	p-value
Value/Usefulness	30446	0.66	$< 2.2\times10^{-16}$
Interest/Enjoyment	25968	0.43	$< 2.2\times10^{-16}$
Effort/Importance	23994	0.33	5.883×10^{-11}
Perceived Choice	23197	0.29	8.429×10^{-9}
Pressure/Tension	21974	0.23	3.589×10^{-6}
Perceived Competence	20244	0.15	0.00391

Discussion and conclusions

Verification of the effectiveness of various conceptions in the educational process is fundamental, especially if research results add to the implementation of effective approaches to practice. The results of statistical analysis prove that IBI in comparison with TI has a significantly positive influence on all intrinsic motivation subscales.

We consider the main contribution of the study to be the empirical confirmation of the IBI effect on increasing intrinsic motivation to learn Geography. The study gives evidence that IBI has a significantly positive influence on 5th grade students' motivation, which supports claims of the importance of relatedness, competence and autonomy in learning (Ryan & Deci, 2000). Other studies using the IMI questionnaire present comparable results (e. g. Schunk & DiBenedetto, 2020). The most marked effect of IBI appeared in the Value/Usefulness subscale, confirmed also by Meulenbroeks et al. (2023) and Teplá & Distler (2025). This result suggests that motivation is encouraged by activities students perceive as meaningful – they relate to their interests and goals. There is a marked difference between TI and IBI also in Interest/Enjoyment in the educational activity, confirmed also by Meulenbroeks et al. (2023). Their and our results highlight the significance of attractive, interactive content for

student engagement. Also, motivation is increased by the feeling of autonomy – when students may select tasks or problem solving methods, their engagement grows. An important factor is also the perceived competence – students are more motivated when feeling that their decisions influence results.

We see the key contribution of the study to educational practice in encouraging teachers to support intrinsic motivation through inquiry elements in Geography instruction. However, IBI may not motivate all students the same, since motivation is a combination of personality traits, interests and external factors. To maintain motivation, we recommend to set objectives, break down tasks into smaller steps and give regular feedback.

Limitation of research

Although the research probe among 5th grade elementary school students in Slovakia brought valuable insights about the influence of IBI on their intrinsic motivation, due to the research sample size and respondents' limited experience with IBI the results cannot be considered generally representative. Students' intrinsic motivation is influenced by a number of factors, which were not sufficiently investigated. However, in combination with other similarly oriented research, this study can serve as a relevant argument in support of the implementation of inquiry elements in Geography instruction.

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References:

Amri, M., Prasetyo, J., Halim, C., & Adhimas, Y. B. (2024). Assessing the influence of peer collaboration, classroom management, and assessment practices on student motivation in secondary education. *International Journal of Business, Law, and Education, 5*(2), 1678–1686. doi: 10.56442/ijble.v5i2.660.

Baker, R. S., Cloude, E., Andres, J. M. A. L., & Wei, Z. (2025). The confusion constellation: A new way of looking at confusion and frustration. *Cognitive Science, 49*(1), 1–30. doi: 10.1111/cogs.70035.

Bhandari, P. (2023). *What is effect size and why does it matter?* (Examples). Retrieved from https://www.scribbr.com/statistics/effect-size/

Funder, D. C., & Ozer, D. J. (2019). Evaluating effect size in psychological research: Sense and nonsense. *Advances in Methods and Practices in Psychological Science, 2*(2), 156–168. doi: 10.1177/2515245919847202.

Gibson, K. E., Erskine, O. M., Lamm, K. W., Lamm, A. J., Warner, L. A., & Holt, J. (2024). Determining the applicability and use of the Intrinsic Motivation Inventory in the context of water conservation. *Sustainability, 16*(23), 10262. doi: 10.3390/su162310262.

Holte, J., Endres, R., Besser, D., & Dunston, D. (2020). The influence of active, passive, and mixed classroom activities on student motivation. *Proceedings of the ASEE Annual Conference.* doi: 10.18260/1-2-35342.

Jowett, S., Warburton, V. E., Beaumont, L. C., & Felton, L. (2023). Teacher–student relationship quality as a barometer of teaching and learning effectiveness: Conceptualization and measurement. *British Journal of Educational Psychology, 93*(3), 842–861. doi: 10.1111/bjep.12600.

Jurečková, M., Kmeťová, J., & Skoršepa, M. (2024). Science process skills and level of knowledge of primary education students. *The New Educational Review, 76*(1), 123–134. doi: 10.15804/tner.2024.77.3.12.

Minner, D. D., Levy, A. J., & Century, J. (2010). Inquiry based science instruction – what is it and does it matter? Results from a research synthesis years 1984 to 2002. *Journal of Research in Science Teaching, 47*(4), 474–496. doi: 10.1002/tea.20347.

Meulenbroeks, R., van Rijn, R., & Reijerkerk, M. (2023). The impact of long-term inquiry-based science education on students' motivation and knowledge acquisition: The role of gender, subject, and level of inquiry. *Research in Science Education, 54(3), 339–358.* doi: 10.1007/s11165-023-10139-0.

Mendoza, N. B., Yan, Z., & King, R. B. (2023). Supporting students' intrinsic motivation for online learning tasks: The effect of need-supportive task instructions on motivation, self-assessment, and task performance. *Computers & Education, 193*, 104663. doi: 10.1016/j.compedu.2022.104663.

R Core Team. (2021). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing. Retrieved from https://www.R-project.org/

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*(1), 68–78. doi: 10.1037/0003-066X.55.1.68.

Sam, R. (2024). Systematic review of inquiry-based learning: Assessing impact and best practices in education. *F1000Research, 13*, 1045. doi: 10.12688/f1000research.155367.1.

Saro, J. M., Manliguez, M. E., Buar, I. J. M., Buao, A. B., & Almonicar, A. S. (2022). New normal education: Strategies, methods, and trends of teaching-learning on students' perspectives and its effectiveness. *Psychology and Education: A Multidisciplinary Journal*, *5*(1), 259–265. doi: 10.5281/zenodo.7242770.

Shin, D. D., Park, Y., Lee, M., Kim, S., & Bong, M. (2023). Are curiosity and situational interest different? Exploring distinct antecedents and consequences. *British Journal of Educational Psychology, 93*(4), 1207–1223. doi: 10.1111/bjep.12627.

Schunk, D. H., & DiBenedetto, M. K. (2020). Motivation and social-emotional learning: Theory, research, and practice. *Contemporary Educational Psychology*, *60*, 101830. doi: 10.1016/j.cedpsych.2019.101830.

Teplá, M., & Distler, P. (2025). The impact of long-term inquiry-based science education on students' motivation and knowledge acquisition: The role of gender, subject and level of inquiry. *Humanities and Social Sciences Communications*, *12*(1), Article 112. doi: 10.1057/s41599-025-04437-3.

Xie, J., Cho, K. W., Wei, T., Xu, J., & Fan, M. (2025). The effects of academic emotions on learning outcomes: A three-level meta-analysis of research conducted between 2000 and 2024. *Learning and Motivation, 90*, 102–109. doi: 10.1016/j.lmot.2025.102109.

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