Teacher Half-Yearly Journal *17*(1),48-62, 2025

Unraveling Gender Influences on Students' Attitudes in Physics Education

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Submitted: March 11, 2024; Accepted: July 12, 2024; Published: January 31, 2025

Abstract

This study examines the subtle effect of bachelor-level students' attitudes toward physics education from gender perspectives in constituent education campuses affiliated with Tribhuvan University. A cross-sectional survey approach was employed to collect data from a sample of 71 participants, consisting of 23 males and 48 females. A five-point Likert scale was the primary tool for data collection. The enquiry focused on students' perceptions of physics education, capturing their current attitudes and views at a specific moment in time. The research aimed to assess the nuanced influences of gender on different perspectives related to enthusiasm for physics, perceptions of physics as a dynamic process, and satisfaction with subject teachers' attributes. The findings showed robust enthusiasm, contentment with learning, and positive attitudes toward physics were observed, with satisfaction in class responses, engagement in lab work, and active problem-solving practices in both male and female students, offering valuable insights for promoting inclusivity and improving teaching methodologies in physics education. In the realm of physics learning.

Key words: Perception, subtle attitudes, satisfaction, Gender, Physics education

Introduction

Understanding the concept of physics education is pivotal for students' scientific literacy. Proper comprehension of scientific concepts and terminology correlates directly with the quality of knowledge, preventing misconceptions. Despite challenges in grasping certain physics concepts, students' moderate motivation underscores the significance of effective teaching methods in fostering engagement and understanding (Stojanovic & Maksimovic, 2022).

Physics is often perceived as one of the most challenging areas within the field of science, typically attracting fewer students compared to other science-related subjects from secondary to tertiary level. This trend leads to a generally negative attitude toward physics, stemming from a lack of interest in the subject and its syllabus (Ibrahim et al., 2019). Understanding students' perception of physics; material is crucial, given its challenging and abstract nature, often attributed to complex mathematical calculations. Despite the enjoyment associated with learning physics, its abstractness can pose difficulties for students. While research suggests

misconceptions can be addressed, they often resurface. Hindrances such as attitudes and beliefs can impede effective learning and enthusiasm in physics education (Sakinah et al., 2023).

The issue of gender influences on students' attitudes in physics education is of significant concern within the global educational landscape. Despite numerous initiatives aimed at promoting gender equity in Science, Technology, Engineering, and Mathematics (STEM) fields, disparities persist. Research indicates that male students often exhibit more positive attitudes toward physics, characterized by higher confidence levels, enthusiasm, and satisfaction compared to their female counterparts. For instance, studies have demonstrated that societal stereotypes and traditional gender roles can adversely impact female students' self-efficacy and interest in physics, leading to lower enrollment and retention rates in these courses (Miller et al., 2021; UNESCO, 2021).

The dynamics of gender attitudes toward physics education are further complicated by cultural contexts. In many regions, including South Asia, deep-rooted societal norms dictate educational paths and career choices, often discouraging girls from pursuing science-related fields. Educational reforms aimed at fostering inclusivity and engagement in Science, Technology, Engineering, and Mathematics (STEM) fields have made progress; however, challenges remain. Research shows that female students frequently experience anxiety and a lack of confidence in their physics abilities, which can stem from both classroom experiences and external societal pressures (Khan et al., 2022).

In the context of Nepal, despite efforts to enhance gender equity in education, female students still face substantial barriers, including inadequate resources, limited role models in physics, and societal expectations that prioritize traditional gender roles. These factors significantly influence their attitudes toward physics, often leading to a perception of the subject as less accessible or relevant (Catena & Testa, 2024). Understanding how gender affects students’ attitudes toward physics education is crucial to knew the facts behind its perception for developing effective strategies that create a more inclusive and supportive learning environment in educational arena of the country. By addressing these influences, educators can better encourage all students to engage and consider it as a viable academic and career option in physics.

Statement of Problem

Despite increased female participation in higher education, their enrollment in science education, particularly physics, remains low in Nepal (Acharya, 2021). Research indicates that gender significantly influences students' attitudes toward education (Manchana & Gannavarapu, 2024); however, the specific impact on physics education remains underexplored. This study seeks to investigate how gender affects bachelor-level students' attitudes toward physics, taking Kathmandu and Bhaktapur districts as a sample area, addressing a crucial gap in understanding gender disparities and informing strategies to promote equal participation in science education.

Objectives

1. To assess the students' perception toward physics education.
2. To examine the subtle effect on impacts in physics learning of gender using statistical methods.

Research Questions

1. How does gender influence students' attitudes toward physics education at bachelor-level?
2. What are the different perceptions of student's subtle attitudes toward physics education?

Literature review

Early research underscores the significance of exploring student attitudes towards specific science practices. Attitudes towards learning environments and instructional methods profoundly influence learning outcomes, reflecting positive or negative sentiments (Saini, 2023). This crucial factor in learning encompasses sub-constructs like interest, satisfaction, and motivation. Informally, attitudes may connote mood concepts or even adolescent rebellion (Wang et al., 2023).

Advancement in science and technologies is the pathway for countries advancement where developing scientific human capital is a crucial foundation. Secondary and tertiary education has a big role in developing such human capital. In this regards, attitude towards science encompasses feelings, beliefs, and values regarding science-related ventures, including its impact on society and scientists. It reflects favor or disfavor towards objects, people, or ideas, ranging from positive to negative judgments, whether concrete or abstract (Saini, 2023).

In physics education, math proficiency and logical reasoning are vital, while students' attitudes significantly influence their engagement with the material (Haynes et al., 2023; Iqbal et

al., 2023). Positive attitudes correlate with better learning outcomes, while negativity can hinder potential and confidence (Iqbal et al., 2023). Addressing students' attitudes is crucial for optimizing learning experiences. Moreover, attitudes encompass perceptions of physics coherence, relevance, and the relationship between math and physics concepts, emphasizing the need to foster positivity for effective learning (Haynes et al., 2023; Iqbal et al., 2023; Wang & Bai, 2023).

Bachelor-level students' attitudes toward physics education are crucial, particularly regarding gender dynamics. Recent research (Manchana & Gannavarapu, 2024) underscores gender's role in shaping students' perceptions of education. However, the influence of gender dynamics on these attitudes remains underexplored. Thus, this investigation aims to enhance understanding and develop tailored educational strategies accommodating diverse perspectives, enthusiasm, and satisfaction. Gender-based disparities highlight the necessity for a comprehensive examination of factors shaping attitudes, particularly in physics education.

Methods

Sample Size

The study comprised a sample of 71 participants drawn from bachelor-level students in Kathmandu and Bhaktapur districts, affiliated with Tribhuvan University. The sample included 23 male and 48 female students, ensuring a diverse representation.

Research Design

A cross-sectional survey design was employed to gather data on students' attitudes toward physics education. This design allowed for the collection of information at a single point in time, providing insights into the current perceptions and attitudes of the participants.

Data Collection tools and Procedures

The survey instrument with a five-point Likert scale was the primary tool for data collection. It included sections addressing diverse perspectives related to enthusiasm toward physics, physics learning experiences, perception of physics as a dynamic process, and satisfaction with subject teacher. The survey items were developed based on a comprehensive review of relevant literature and were pre-tested to ensure clarity and relevance.

Data collection involved the distribution of surveys with a five-point Likert scale to the selected participants. The Likert scale ranged from "Strongly Disagree" to "Strongly Agree," offering participants a nuanced spectrum to express their attitudes. The surveys were

administered in-person, ensuring a face-to-face interaction to clarify any potential queries and to enhance the overall response rate. The participants were informed about the purpose of the study, and their voluntary participation was emphasized. Ethical considerations, including confidentiality and anonymity, were strictly adhered to throughout the data collection process. The sampling technique involved purposive sampling to ensure representation across gender and academic levels. The use of SPSS for analyzing data ensured a rigorous and systematic analysis, enhancing the reliability and validity of the study's findings.

Tools for Analysis

The collected data were analyzed using the Statistical Package for the Social Sciences (SPSS) software, version 20. SPSS facilitated a robust statistical analysis, including descriptive statistics to present an overview of the participants' attitudes and inferential statistics to explore potential associations and variations. By utilizing a five-point Likert scale in the survey design, the study aimed to capture a nuanced understanding of students' attitudes, allowing for a more fine-grained analysis of their perceptions.

Variables related to enthusiasm, learning experiences, perceptions of physics, and satisfaction were examined using appropriate statistical tests, allowing for a comprehensive understanding of the gender-specific influences on bachelor-level students' attitudes toward physics education.

Analysis and Interpretation

Table 1. *Attitude Test for Enthusiasm towards Physics*

Factor I: enthusiasm toward physics	Gender								
	Male			Female			Total		
	Mean	N	Median	Mean	N	Median	Mean	N	Median
I appreciate learning about physical occurrences and their descriptions the most	4.13	23	4	4.23	48	4	4.2	71	4
It is not worthwhile to study physics issues in more detail	2.39	23	2	3.02	48	3	2.82	71	3
Performing a physics experiment in a lab boosts	4.26	23	4	4.46	48	5	4.39	71	5

my confidence									
Everyone benefits from having a foundational understanding of physics	4.65	23	5	4.35	48	4	4.45	71	5
I find studying physics to be tedious	1.91	23	2	2.17	48	2	2.08	71	2
I'm motivated to conduct additional experiments after a successful physics experiment	3.87	23	4	3.98	48	4	3.94	71	4
I'd be pleased to have fewer practical physics work so that I may spend more time studying theory	3.09	23	3	3.27	48	3	3.21	71	3
I finish my physics assignments on time	3.87	23	4	3.96	48	4	3.93	71	4
I look forward to physics class with anticipation	3.61	23	4	3.79	48	4	3.73	71	4
With my friends, I discuss about physics	4	23	4	4.23	48	4	4.15	71	4

Note. Analyzed by SPSS 20.

Table 1, focusing on enthusiasm toward physics by gender, revealed a high level of enthusiasm among both male and female students, evidenced by mean scores of approximately 4.20 out of 5. While males tended to perceive detailed study of physics issues as less worthwhile than females, both genders acknowledged the positive impact of lab experiments on confidence.

There was a unanimous belief in the benefits of having a foundational understanding of physics, reflected in mean scores around 4.45. Both males and females demonstrated motivation for extra experiments and timely completion of assignments. Despite a slight gender difference in the perceived tedium of studying physics, with males finding it less tedious, both groups

eagerly anticipated physics class and actively engaged in discussions about the subject with their friends.

Table 2. *Attitude Test for Physics Learning*

Factor II: physics learning	Gender								
	Male			Female			Total		
	Mean	N	Median	Mean	N	Median	Mean	N	Median
In regards to my responses to the physics class questions, I am really happy and satisfied	3.96	23	4	4.15	48	4	4.08	71	4
Physics lab work increases individual productivity	4.17	23	4	4.15	48	4	4.15	71	4
I continue to practice the class problems until I master them	3.83	23	4	3.81	48	4	3.82	71	4
In my physics lesson, I feel under pressure	2.48	23	3	2.48	48	2	2.48	71	2
Understanding of physics is effectively achieved when students actively participate in both theory and practical lessons	4.13	23	4	4.27	48	4.5	4.23	71	4
Problem with real-world situation due to lack of physics courses	2.48	23	3	3.48	48	4	3.15	71	3
I make an effort to relate the physics issue to real-world circumstances	3.43	23	3	3.69	48	4	3.61	71	4
Instead of tackling physics problems, I try to concentrate more on memorizing the laws and derivations from the textbook	3.65	23	4	3.5	48	3.5	3.55	71	4
Numerous physics scenarios are challenging to visualize	3.74	23	4	3.92	48	4	3.86	71	4
It is exceedingly challenging to pass a physics exam without using a cheat sheet	2.22	23	2	2.4	48	2	2.34	71	2
I am not interested in challenging physics topics	2.61	23	2	2.73	48	3	2.69	71	3
I'm forced to study physics by my parents and my teacher	2.39	23	2	2.83	48	3	2.69	71	3
I only study physics when it's time for an exam	2	23	2	2.23	48	2	2.15	71	2
It's beyond my capacity to learn physics	2.52	23	2	2.85	48	3	2.75	71	3

Note. Analyzed by SPSS 20.

Factor II, examining physics learning by gender, showcased positive sentiments among both male and female students. They expressed satisfaction with their responses to physics class questions, with mean scores around 4.08 out of 5. A consensus emerged on the enhancement of individual productivity through physics lab work, reflected in mean scores around 4.15. Both genders actively practiced class problems for mastery, emphasizing an engaged learning approach, with mean scores ranging from 3.82 to 4.00.

Despite a slight gender difference in the perception of pressure during physics lessons, understanding physics was effectively achieved through active participation, with females indicating a slightly higher mean score of 4.27 compared to males' 4.13. Relating physics issues to real-world circumstances was common, with mean scores around 3.61 to 4.00. Additionally, both genders preferred tackling physics problems over memorization, as reflected in mean scores ranging from 3.55 to 4.00. Visualizing challenging physics scenarios posed difficulty, with mean scores around 3.74 to 4.00. The data indicated a low inclination toward using cheat sheets during exams, with mean scores ranging from 2.22 to 2.34. Both genders expressed moderate interest in challenging physics topics, with mean scores around 2.69 to 3.00. There was a consensus that students were not coerced into studying physics, with mean scores around 2.69 to 3.00. Overall, the majority of students consistently studied physics rather than solely during exam periods, as reflected in mean scores ranging from 2.15 to 2.00.

Table 3. *Attitude Test for Physics as a Process*

Factor III: physics as a process	Gender								
	Male			Female			Total		
	Mean	N	Median	Mean	N	Median	Mean	N	Median
Physics is a subject that is always changing	3.87	23	4	3.77	48	4	3.8	71	4
Physics is a process for acquiring knowledge, not just a body of knowledge	4.26	23	4	4.44	48	4	4.38	71	4
The laws that have already been discovered do not require further verification	2.7	23	3	2.73	48	2	2.72	71	3
The truth of the laws of physics might no longer hold true tomorrow due to the rapid advancement of scientific knowledge	3.09	23	3	3.46	48	3	3.34	71	3
There will eventually be a discovery of all physics laws	3.43	23	3	3.25	48	3	3.31	71	3
In order to improve civilization and society, physics is crucial	4.3	23	4	3.92	48	4	4.04	71	4
Physics is all about memorization of rules and formulas; it lacks creativity	2.78	23	3	2.96	48	3	2.9	71	3
Science and other subjects have benefited immensely from the study of physics	4.39	23	4	4.44	48	4.5	4.42	71	4
Physics trains the mind and fosters critical thinking in students	4.39	23	4	4.44	48	5	4.42	71	5
Building a physics lab requires a substantial amount of infrastructure in order to comprehend the field	3.43	23	4	3.79	48	4	3.68	71	4

Note. Analyzed by SPSS 20.

Factor III, which explores the perception of physics as a process, was analyzed across genders, revealing interesting insights into students' perspectives. Both male and female respondents expressed agreement that physics is a subject in constant evolution, with mean

scores around 3.80, indicating a belief in its dynamic nature. There was a strong consensus that physics is not just a body of knowledge but a process for acquiring knowledge, with mean scores of 4.38 for males, 4.44 for females, and 4.04 overall, highlighting the recognition of the active nature of learning in physics. When it comes to the need for further verification of discovered laws, both genders showed a neutral stance, with mean scores around 2.72, suggesting a balanced perspective.

Regarding the potential change in the truth of physics laws due to scientific advancements, there was a shared belief in this possibility, as reflected in mean scores around 3.34. On the idea of eventually discovering all physics laws, students expressed a slightly positive outlook, with mean scores around 3.31. With mean scores of 4.30 for men, 3.92 for women, and 4.04 overall, both genders firmly agreed on the role that physics plays in advancing civilization and society. The idea that physics is only memorization was opposed by both male and female respondents (mean scores = 2.90), but there was general agreement (mean scores = 4.42) that studying physics has greatly advanced science and other subjects.

Moreover, physics was seen as a tool for training the mind and fostering critical thinking, with mean scores around 4.42, showcasing its perceived educational value. When considering the infrastructure required for a physics lab, there was a general agreement that it demands substantial resources, reflected in mean scores around 3.68.

Table 4. *Attitude Test regarding Physics Teacher's attributes*

Factor IV: physics teacher	Gender								
	Male			Female			Total		
	Mean	N	Median	Mean	N	Median	Mean	N	Median
My physics teacher makes me nervous	2	23	2	1.67	48	1	1.77	71	1
My physics teacher consistently gives the students too many assignments	2.7	23	2	2.46	48	2	2.54	71	2
Problem-solving is encouraged by my physics teacher	4.22	23	4	4.33	48	4	4.3	71	4
The numerical problems regarding with a physics topic covered in class are rarely discussed by my physics teacher	2.7	23	2	2.98	48	2.5	2.89	71	2

My physics teacher regularly attends class every time	4.13	23	5	3.96	48	4	4.01	71	4
My physics teacher discourages students from addressing questions in class	2.3	23	2	2.25	48	2	2.27	71	2
My physics teacher doesn't explain the material in the lesson in a coherent manner	2.74	23	2	2.52	48	2	2.59	71	2
During class, my physics teacher employs a variety of teaching strategies	3.39	23	3	3.71	48	4	3.61	71	4
My physics teacher frequently conducts lessons in a lecture method	3.48	23	4	3.19	48	3	3.28	71	3
My physics teacher takes the necessary time to explain physics concepts to me	3.91	23	4	3.94	48	4	3.93	71	4
My physics teacher doesn't think I can learn	2	23	2	2.31	48	2	2.21	71	2
My physics teacher often loses patience with me	2.3	23	2	2.31	48	2	2.31	71	2
My physics teacher places a strong emphasis on comprehension rather than rote learning	3.74	23	4	3.62	48	4	3.66	71	4
In the future, I want to be a physics teacher	3.61	23	4	3.38	48	3	3.45	71	4

Note. Analyzed by SPSS 20.

Factor IV, which delved into students' perceptions of their physics teachers, revealed nuanced views across genders. Male and female respondents generally reported low levels of nervousness induced by their physics teachers, with mean scores of 1.77 and 1.67, respectively, indicating a generally calm learning environment. The perception of receiving too many assignments from physics teachers was mildly present, with mean scores around 2.54 for both genders, suggesting a moderate workload concern.

The encouragement of problem-solving by physics teachers was well-received by both males and females, as reflected in mean scores around 4.30, indicating positive teacher support for active engagement. However, there were slight variations in views on the frequency of discussing numerical problems in class, with females expressing a somewhat higher desire for more discussions (mean score of 2.98) compared to males (mean score of 2.70). The attendance of physics teachers received positive recognition from both genders, with mean scores of 4.01, highlighting the importance placed on regular teacher presence. While both male and female students reported minimal discouragement from addressing questions in class, there were subtle differences, with females perceiving slightly more encouragement (mean score of 2.25) than males (mean score of 2.30).

The coherence of lesson explanations saw minimal gender differences, with mean scores around 2.59, indicating a generally consistent teaching style. Regarding teaching strategies, both genders appreciated the variety employed by physics teachers, with mean scores around 3.61, emphasizing the value of diverse instructional methods. While there was a consensus on the avoidance of excessive use of the lecture method, with mean scores around 3.28, a balanced approach was apparent. The time devoted to explaining physics concepts was well-received by both genders, with mean scores around 3.93, reflecting a positive perception of teacher dedication. The emphasis on comprehension over rote learning was similarly appreciated by both males and females, with mean scores around 3.66, indicating a preference for deeper understanding.

Lastly, the desire to become a physics teacher in the future was moderately expressed by both genders, with mean scores of 3.45, reflecting a shared interest in pursuing a teaching role. Overall, the findings highlight a generally positive perception of physics teachers with minor variations across genders in certain aspects of teaching practices.

Results and Discussion

The results, discussed across four factors, offer valuable insights into how gender influences bachelor-level students' attitudes toward physics education. Both male and female students exhibited a strong eagerness for learning about physical occurrences, emphasizing a shared appreciation for foundational understanding. In the realm of physics learning, positive sentiments were observed, with satisfaction in class responses, engagement in lab work, and active problem-solving practices. Analyzing physics as a process revealed students' recognition

of its dynamic nature and rejection of memorization, underlining its significance in societal advancement. Students' views on physics teachers demonstrated a generally positive perception, with slight variations across genders.

These outcomes contrasted with the results of studies by Stoeckel and Roehrig (2021), and Cwik and Singh (2023), which highlighted positive attitudes and perceptions of physics among male students. In contrast, they harmonize with the findings of Aina and Akintunde (2013), and Godwin and Okoronka (2015), who investigated positive attitudes toward physics education among both male and female students.

Overall, these findings emphasize the importance of fostering inclusivity and refining teaching practices to enhance physics education. The study contributes to a deeper understanding of the complex dynamics influencing students' attitudes in this educational domain.

Findings and Conclusion

In conclusion, the retrospective analysis of students' attitudes toward physics, categorized by gender, uncovered valuable insights. Both male and female students expressed a strong appreciation for learning about physical occurrences, demonstrating shared enthusiasm for foundational understanding and active participation in physics theory and practical class.

The exploration of students' experiences and attitudes towards physics education revealed overall satisfaction, consensus on laboratory work benefits, and active learning practices across genders. Students recognized the dynamic nature of physics, emphasizing its active acquisition process. Positive views on physics teachers were generally consistent, with minor variations across genders. These findings highlight the importance of nuanced approaches to foster enthusiasm, active learning, and positive perceptions in physics education, taking into account diverse student perspectives.

References

Acharya, D. R. (2021). Status of girls' participation in higher education in Nepal. *International Journal of Multidisciplinary Perspectives in Higher Education*, *6*(2), 68-85. https://doi.org/10.32674/jimphe.v6i2.3922

Aina, J. K., & Akintunde, Z. T. (2013). Analysis of Gender Performance in Physics in Colleges of Education, Nigeria *Journal of Education and Practice*, *4*(6), 1-5.

Catena, D., & Testa, I. (2024). Exploring students' attitudes towards physics and their association with gender. *Journal of Physics: Conference Series*, *2727*(1), 012017. https://doi.org/10.1088/1742-6596/2727/1/012017

Cwik, S., & Singh, C. (2023). Women Have Lower Physics Self-Efficacy and Identity Even in Courses in Which They Outnumber Men: A Sign of Systemic Inequity? *Electronic Journal for Research in Science Mathematics Education*, *27*(2), 99-119.

Godwin, B. A., & Okoronka, U. (2015). Attitude and academic performance of senior secondary school students in physics in Nigeria. International Conference on Education,

Haynes, M., Brown, A., Nichols, K., & Parveen Musofer, R. (2023). Measurement of student attitudes to science and association with inquiry-based learning in regional schools. *International Journal of Science Education*, *45*(8), 593-612. https://doi.org/10.1080/09500693.2023.2168138

Ibrahim, N., A Zakiang, M. A., & Damio, S. M. (2019). Attitude in learning physics among form four students. *Social Management Research Journal*, *16*(2), 21-42. https://doi.org/10.24191/smrj.v16i2.7060

Iqbal, M., Farida, L. Z. N., & Win, K. T. (2023). The Influence of Student Attitudes on Learning Achievement. *Jurnal Ilmiah Ilmu Terapan Universitas Jambi*, *7*(2), 93-99. https://doi.org/10.22437/jiituj.v7i2.26697

Khan, M., Abid Siddiqui, M., & Malone, K. L. (2022). Scientific attitudes: gender differences, impact on physics scores and choices to study physics at higher levels among pre-college STEM students. *International Journal of Science Education*, *44*(11), 1816-1839. https://doi.org/10.1080/09500693.2022.2097331

Manchana, V., & Gannavarapu, S. V. (2024). Role of Gender perceptions in shaping gender-based discrimination and gender equality among school-going adolescents, Telangana: A cross-sectional community-based study. *Journal of Family Medicine Primary Care*, *13*(2), 774-779. https://doi.org/10.4103/jfmpc.jfmpc_1238_23

Miller, R. A., Vaccaro, A., Kimball, E. W., & Forester, R. (2021). "It's dude culture": Students with minoritized identities of sexuality and/or gender navigating STEM majors. *Journal of Diversity in Higher Education*, *14*(3), 340. https://doi.org/10.1037/dhe0000171

Saini, R. (2023). Attitude Towards Science Education Among Secondary School Students. *International Journal of Research in Economics and Social Sciences (IJRESS)*, *6*(12), 393-401.

Sakinah, N., Amalia, I. F., & Adimayuda, R. (2023). Identifying senior high school students' misconception on the momentum and impulse concepts uses three-tier diagnostic test. *Research in Physics Education*, *2*(1), 18-25. https://doi.org/10.31980/ripe.v2i1.2377

Stoeckel, M. R., & Roehrig, G. H. (2021). Gender differences in classroom experiences impacting self-efficacy in an AP Physics 1 classroom. *Physical Review Physics Education Research, 17*(2), 1-9. https://doi.org/10.1103/PhysRevPhysEducRes.17.020102

Stojanovic, M., & Maksimovic, B. (2022). Scientific concepts related to physics from the perspective of students of biology. Journal of Physics: Conference Series,

UNESCO. (2021). *Global Education Monitoring Report 2021–Central andEastern Europe, the Caucasus and Central Asia–Inclusion and education: All means all*.

Wang, C., Ahmad, S., Ayassrah, A., Awwad, E., Irshad, M., Ali, Y., & Han, H. (2023). An empirical evaluation of technology acceptance model for Artificial Intelligence in E-commerce. *Heliyon*, *9*(8). https://doi.org/10.1016/j.heliyon.2023.e18349

Wang, J., & Bai, B. (2023). Whose goal emphases play a more important role in ESL/EFL learners' motivation, self-regulated learning and achievement?: Teachers' or parents'. *Research Papers in Education*, *38*(4), 520-542. https://doi.org/10.1080/02671522.2022.2030395