

# How do Coastal High School Students Perceive Student-centred Learning Approach?

*Satria Agust<sup>1,\*</sup>, Eko Febri Syahputra Siregar<sup>1</sup>, Nur Eka Kusuma Hindrasti<sup>1</sup>, Abdul Malik<sup>1</sup>, Desi Rahmatina<sup>1</sup>, Inelda Yulita<sup>1</sup>, Çağlar Demir<sup>2</sup>, Khofifah Khofifah<sup>1</sup>, Aminingsih Aminingsih<sup>1</sup>, Irawati Irawati<sup>1</sup>, Nurul Hafizah<sup>1</sup>, Raja Noviani<sup>1</sup>, Shindy Yunn Sinaga<sup>1</sup>, and Windy Maharani<sup>1</sup>*

<sup>1</sup>Maritime University of Raja Ali Haji Riau Islands Province, Indonesia

<sup>2</sup>School of Foreign Languages, Balıkesir University, Turkiye

**Abstract.** This study explores the perceptions of coastal high school students regarding the student-centred learning approach, which prioritizes student autonomy and active engagement. The research specifically focused on Junior High School Number 10 in Tanjungpinang, Riau Islands Province, to understand how geographic and socioeconomic factors influence these students' educational experiences. Utilizing a descriptive quantitative research design, data were collected through structured questionnaires, followed by analysis using the Rasch Model. This study investigates how coastal high school students view student-centred learning, highlighting the benefits to participation and academic performance in particular. However, certain noteworthy obstacles were noted, including the scarcity of technology and the difficulty of adjusting to more autonomous learning environments. Solutions like improved technology infrastructure and focused teacher preparation are proposed to address these problems. These results highlight how crucial it is to offer customized educational support in coastal areas in order to maximize the efficacy of student-centred pedagogies.

## 1 Introduction

Educational pedagogy has been moving more and more in the direction of student-centred learning strategies in recent years. Student-centred learning places a higher priority on students' active engagement in their own learning processes than traditional teacher-centred approaches, which place an emphasis on the transfer of knowledge from instructor to student. This method is based on the idea that students learn more efficiently when they are involved, inspired, and given the chance to take charge of their education [1,2]. Constructivism has influenced educational practices such as the student-centred approach, which views learning as an intricate, dynamic process. Learners actively participate in the process, customizing it to suit their own learning methods rather than passively taking in knowledge. As mentors, teachers assist students in creating their own knowledge systems [3].

Student-centred learning approaches, which place a high value on students' active engagement and participation in their education, have been more prevalent in the

---

\* Corresponding author: [satria.agust@umrah.ac.id](mailto:satria.agust@umrah.ac.id)

educational environment. This pedagogical approach emphasizes the value of students' autonomy, critical thinking, and collaborative abilities in contrast to traditional teacher-centred approaches. [4] state that under a student-centred approach, each student creates a distinct path to a solution, which they then discuss and refine with other classmates before defending their answers and the method by which they arrive at them. [5] emphasize that since student-centred learning involves students actively participating in their education, it is considered a method that prioritizes deep learning and understanding. To some degree, diverse learning needs and styles are accommodated via student-centred learning approaches, which include strategies like project-based learning, flipped classrooms, and peer-assisted learning. It is critical to comprehend how various student populations view and react to these approaches as this paradigm becomes more and more popular globally.

A wide range of teaching techniques intended to promote greater comprehension and critical thinking abilities are included in student-centred learning. These techniques encompass project-based learning, in which students investigate issues and difficulties from the real world; collaborative learning, which places an emphasis on communication and collaboration; and personalized learning, which is catered to the unique requirements and interests of every learner [6-7]. These approaches seek to foster a deeper and more interactive educational experience by putting students at the centre of the process.

Coastal areas offer special opportunities and challenges for student-centred learning. These regions need specialized educational strategies since they are frequently defined by a reliance on certain industries for economic growth, like fishing, and by restricted access to educational resources. Because of their remote location and financial limitations, coastal pupils benefit less from standard teacher-centred learning methods. With its emphasis on independence and practical problem-solving, student-centred learning is especially well-suited to tackling these issues since it gives students the ability to integrate their learning into the community. Implementing these student-centred methods successfully depends on having a thorough understanding of how students view them. Views held by students have a big impact on their motivation, engagement, and general academic success [8]. While unfavourable impressions can prevent students from participating fully in their education, positive attitudes are likely to increase their willingness to do so. The target population for this research is junior high school students in coastal areas, a group whose distinct geographic and sociocultural background may influence their views and experiences in school. Distinct economic, environmental, and social features are common in coastal locations and can have an impact on education and learning [9]. Teachers and legislators can better adapt educational procedures to these learners' unique needs and situations by investigating how these students view student-centred learning.

One major change that may have an effect on students' academic performance and engagement is the move from teacher-centred to student-centred learning practices. Students living near the coast, who can experience particular environmental and socioeconomic difficulties, stand to gain the most from this change in teaching. The students attending coastal schools frequently encounter environmental challenges, including regular weather disruptions, flooding, and deteriorating infrastructure. The learning outcomes and possibilities for autonomous learning are impacted by these elements, which frequently make it difficult for students to regularly engage with their studies. Studies conducted recently have looked into how this change impacts their views and learning experiences. One study emphasized the difficulties which coastal students encounter while moving to student-centred learning contexts, including getting used to having greater independence and learning new skills for independent study [10]. This change frequently necessitates a role adjustment on the part of teachers as well as pupils, with the latter acting more as facilitators of learning while the former assume greater accountability for their education [11].

The advantages of student-centred learning are widely established, notwithstanding these difficulties. Studies have indicated that implementing student-centred approaches might improve critical thinking abilities, problem-solving techniques, and general learning engagement [12]. Therefore, the collaborative and participatory aspects of student-centred learning environments can be especially advantageous for coastal learners, who might not have as much access to educational resources. The shift to student-centred learning has been greatly aided by the incorporation of educational technologies. It has been demonstrated that the use of technologies like digital educational resources and smart classrooms may create more individualized and engaging learning environments [13]. These technological advancements can assist coastal kids bridge the gap between traditional and modern educational practices by giving them access to a wider choice of educational resources and support [14].

Student-centred learning has real-world applicability, as shown by case studies from different coastal regions. One study, for instance, in a coastal school district discovered that greater levels of engagement and better student achievements resulted from the use of student-centred teaching techniques [15]. The advantages of using educational technologies to support active learning are emphasized by [16-17]. According to the study, students see these teaching strategies favourably because they promote engagement, teamwork, and a deeper comprehension of the subject matter. Students from coastal regions particularly valued the way that theoretical information was applied in real-world settings, as it improved their comprehension and retention [18].

The association between the learning environment and students' subjective happiness was examined in a study that was published in *BMC Medical Education*. Higher levels of contentment and satisfaction were reported by students in student-centred learning environments, and this had a favourable effect on their academic performance [19]. Thus, for coastal students, the shift from teacher-centred to student-centred learning practices brings potential as well as problems. The rewards in terms of engagement, critical thinking, and overall academic success are substantial, even though the adjustment phase might be challenging. Sufficient research and investment in educational technologies and support systems are important to enable this shift and guarantee equitable access to high-quality, student-centred education for all children, including those residing in coastal regions.

Students in coastal areas may encounter particular educational difficulties which are impacted by socioeconomic, cultural, and geographic variables. These places are distinguished by a lack of infrastructure, restricted access to resources, and economic activity strongly linked to the surrounding environment. These elements could affect how students learn and how they feel about using cutting-edge teaching approaches. The coastal students frequently encounter particular topographical and socioeconomic difficulties that have an impact on their educational opportunities. These difficulties include restricted access to technology and educational resources, financial strains arising from nearby sectors (like fishing), and environmental elements such as recurrent flooding. A customized approach to student-centred learning that takes these constraints into account and adjusts to the unique circumstances of the pupils is required in such circumstances [9]. The perceptions of coastal high school students in Tanjungpinang, Riau Islands Province—a area where access to educational resources is restricted due to geographic isolation—are the specific subject of this study. It is essential to comprehend how student-centered learning functions in this kind of setting in order to create instructional strategies that are considerate of these children' needs.

Studies on student-centred learning in diverse settings are becoming more and more numerous. The advantages of student-centred learning have been reported in earlier studies, and these benefits include enhanced academic achievement, higher motivation, and the development of critical thinking abilities. However, the majority of these researches has

concentrated on suburban and urban environments, frequently ignoring communities living in rural and coastal areas. Notably few of them concentrate on the perspectives and experiences of coastal students. This gap in the literature indicates that more research is necessary to determine how these particular environments affect students' participation in student-centred learning. Furthermore, the unique requirements and difficulties faced by students in these regions—such as restricted technological access or different cultural expectations—may have a big impact on how they experience and perceive student-centred learning. The purpose of this study was to look into the perceptions of coastal high school students on the student-centred learning approach.

## **2 Method**

The perceptions of the junior high school students in the coastal areas about the student-centred learning approaches were investigated using a descriptive quantitative research design. Descriptive quantitative research is suitable for collecting and analysing numerical data to understand the characteristics, attitudes, and behaviours of a specific population [21].

### **2.1 Research period and location**

The research was conducted from April to September 2024 at Junior High School Number 10, located in Tanjungpinang, Riau Islands Province. This setting provides a unique context to study the educational experiences of coastal students.

### **2.2 Participants**

The twenty-eight Junior High School Number 10 Ten participated in this study. These students were selected to provide a representative sample of the school's population. The small sample size was appropriate for in-depth analysis and understanding of specific educational practices within a particular context [22].

### **2.3 Data collection**

The data were collected using a structured questionnaire designed to capture students' perceptions of student-centred learning approaches. The questionnaire included Likert-scale items to quantify students' attitudes, engagement levels, and perceived benefits of student-centered learning. Using a structured questionnaire ensures the consistency and reliability of the data collected [23]. The questionnaire was created with consideration for coastal areas while drawing from the body of research already available on student-centered learning. A pilot test was administered to a small sample of students to evaluate clarity, and a panel of experts examined the questions to guarantee validity. Some modest tweaks were made to improve comprehensibility after the pilot. Cronbach's alpha was used to confirm the questionnaire's reliability; the result was a score of 0.91, which denotes strong internal consistency.

### **2.4 Data analysis**

The Rasch Model, a potent statistical instrument for assessing latent characteristics like attitudes and perceptions in educational research, was used to analyse the gathered data. By

converting ordinal data from Likert scales into interval-level measurements, the Rasch Model made it possible to interpret the results in a way that was more accurate and insightful [24]. The Rasch Model was employed to analyse the data in order to evaluate human ability, item difficulty, and data fit to the model. In addition to offering insights into the efficacy of student-centred learning strategies, this research assisted in identifying patterns and trends in students' perceptions [25]. In addition, the Rasch model was used for this investigation because of its capacity to transform ordinal Likert-scale data into measurements at the interval level. Because it provides information on both item difficulty and student ability, this conversion makes it possible to analyse student views more precisely. The results are more dependable and comprehensible because the model guarantees data fit.

### 2.5 Ethical considerations

Prior to any data being collected, all participants were told of the study's goal and their consent was acquired. To guarantee the ethical treatment of participants, confidentiality and anonymity were upheld throughout the whole research procedure [26].

## 3 Findings

### 3.1 Analysis of the data

The Rasch model analysis was conducted on a sample of 147 measured persons and 41 items to assess the perceptions of coastal junior high school students towards student-centred learning approaches. This analysis provides insights into both student abilities and item difficulties, allowing for a comprehensive understanding of the data collected.

**Table 1.** Summary of 147 Measured Person

|                                                                                                                                                                    | Total Score | Count | Measure | Model S.E. | Infit |       | Infit |       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------|---------|------------|-------|-------|-------|-------|
|                                                                                                                                                                    |             |       |         |            | Mnsq  | Zstd  | Mnsq  | Zstd  |
| Mean                                                                                                                                                               | 125.4       | 40.9  | 1.43    | .29        | 1.01  | -.37  | 1.00  | -.43  |
| SEM                                                                                                                                                                | 1.0         | .0    | .08     | .00        | .05   | .21   | .05   | .21   |
| P.SD                                                                                                                                                               | 11.6        | .3    | .98     | .03        | .63   | 2.54  | .64   | 2.55  |
| S.SD                                                                                                                                                               | 11.7        | .3    | .98     | .03        | .64   | 2.55  | .64   | 2.55  |
| MAX.                                                                                                                                                               | 159.0       | 41.0  | 4.96    | .49        | 4.33  | 9.38  | 4.41  | 9.37  |
| MIN.                                                                                                                                                               | 97.0        | 38.0  | -.61    | .24        | .12   | -5.96 | .10   | -6.17 |
| Real Rmse .32 True Sd .92 Separation 2.88 Person Reliability .89<br>Model Rmse .29 True Sd .93 Separation 3.23 Person Reliability .91<br>S.E. OF Person MEAN = .08 |             |       |         |            |       |       |       |       |

Person raw score-to-measure correlation = .99

Cronbach alpha (kr-20) person raw score "test" reliability = .91 sem = 3.56

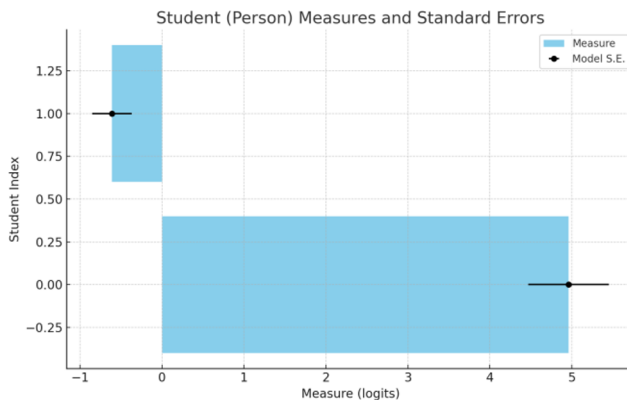
Standardized (50 item) reliability = .93

**Table 2.** Summary of 41 Measured Item

|                   | Total Score | Count | Measure | Model S.E. | Infit      |       | Infit            |       |
|-------------------|-------------|-------|---------|------------|------------|-------|------------------|-------|
|                   |             |       |         |            | Mnsq       | Zstd  | Mnsq             | Zstd  |
| Mean              | 449.5       | 146.8 | .00     | .15        | 1.00       | -.05  | .99              | -.08  |
| SEM               | 4.8         | .1    | .10     | .00        | .03        | .25   | .03              | .26   |
| P.SD              | 30.6        | .4    | .66     | .01        | .19        | 1.58  | .20              | 1.64  |
| S.SD              | 30.9        | .4    | .67     | .01        | .20        | 1.60  | .21              | 1.66  |
| MAX.              | 509.0       | 147.0 | 1.94    | .16        | 1.39       | 3.00  | 1.49             | 3.64  |
| MIN.              | 351.0       | 146.0 | -1.51   | .13        | .54        | -4.25 | .56              | -4.05 |
| Real Rmse         |             | .16   | True Sd | .64        | Separation | 4.10  | Item Reliability | .94   |
| Model Rmse        |             | .15   | True Sd | .64        | Separation | 4.25  | Item Reliability | .95   |
| S.E. Of Item Mean |             | = .10 |         |            |            |       |                  |       |

### 3.2 Person measures

The analysis of person measures reveals several important statistics. The average measure of student ability was found to be 1.43 logits, with a standard error of 0.29. This suggests a moderate level of ability among the students in the sample. The infit and outfit mean square (MNSQ) values, which indicate how well the data fit the Rasch model, are close to the ideal value of 1, with mean infit MNSQ at 1.01 and mean outfit MNSQ at 1.00. This indicates a good fit of the data to the model, suggesting that the responses of the students are consistent with the expectations of the Rasch model [24].



**Fig. 1.** Student measures and Standard errors

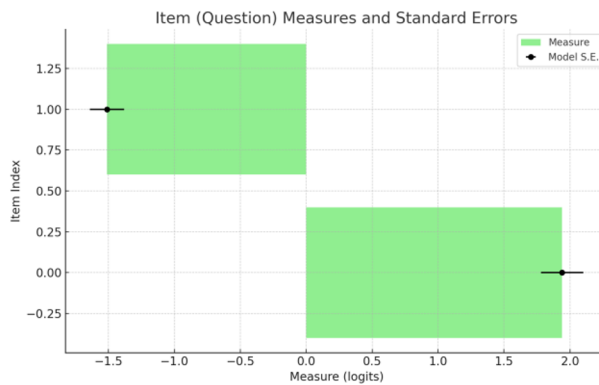
The person separation index is 2.88, with a reliability of 0.89. This indicates that the test can distinguish between approximately three levels of student ability, suggesting that the instrument used is reliable for measuring student perceptions. Additionally, the Cronbach Alpha, a measure of internal consistency, is 0.91, further supporting the reliability of the instrument [27]. The figure 1 explores that the Rasch model was used in this study to evaluate the students' abilities. It gauges how well the students were able to interact with the student-centred learning strategy. Visualizing which pupils found the method entertaining or not is made easier by the figure that shows the measured abilities of students (persons) and their standard errors. This statistic has a direct bearing on the study's objective, which is to determine how effectively coastal kids adjust to a student-centred learning environment. Teachers and legislators may determine which children are

succeeding in this setting and which may require additional support by using the figure, which depicts the range of student skills.

Increased autonomy, chances for active engagement, and the application of theoretical knowledge to actual coastal challenges are some of the main reasons why student-centered learning has been well received by coastal students. The students felt that the more dynamic and engaging learning environment that these elements produced was advantageous.

### 3.3 Item measures

The analysis of item measures provides further insights. The average item difficulty was centred around 0.00 logits, as expected in Rasch analysis, with a standard error of 0.15. The infit and outfit MNSQ values for items are also close to 1, with mean infit MNSQ at 1.00 and mean outfit MNSQ at 0.99. This again indicates a good fit of the items to the Rasch model, suggesting that the items are performing as expected [28].



**Fig. 2.** Item measures and Standard errors

The item separation index is 4.10, with a reliability of 0.94. With a separation index indicating that the items can discriminate among at least four different levels of item difficulty, the high dependability of the items shows that they measure the target feature consistently. This level of item reliability is crucial for ensuring that the instrument can accurately capture the nuances of student perceptions regarding student-centered learning [24]. The figure 2 explains that the intricacy of the questions in this questionnaire was also explained by the Rasch model. This chart shows the students' level of difficulty with each question as well as how well it fits the expected model. This chart is critical to assessing the questionnaire's overall efficacy. In the future, this study can enhance assessments of the students' perceptions by identifying the questions that were either too easy or too difficult. This ensures that, in the context of this study, the questionnaire accurately captures the students' perspectives on the challenges and benefits of student-centered learning in coastal areas.

## 4 Discussion

The analysis of the data collected from the 28 students at Junior High School Number 10 in Tanjungpinang, Riau Islands Province, provides valuable insights into their perceptions of student-centred learning approaches. This discussion interprets these findings in the context of existing literature and the educational environment of coastal students.

#### **4.1 Interpretation of person measures**

The average measure of student ability (1.43 logits) suggests a moderate level of engagement and competence in student-centered learning environments. This is consistent with studies indicating that student-centered approaches can enhance student engagement and autonomy [29]. The high reliability indices (person separation index of 2.88 and person reliability of 0.89) further indicate that the instrument is effectively distinguishing between different levels of student ability and that the data is robust.

The results of the analysis demonstrate that the items on the questionnaire were suitable for gauging students' perceptions, as seen by the good correspond to statistics (infit and outfit MNSQ values close to 1). This alignment is crucial as it validates the use of this instrument in assessing the impact of student-centered learning approaches in this context [27].

#### **4.2 Interpretation of item measures**

The item analysis shows an average item difficulty of 0.00 logits, which is typical in Rasch analysis, ensuring that items are appropriately challenging for the student sample. The high item reliability (item separation index of 4.10 and reliability of 0.94) indicates that the items consistently measure the intended construct, providing confidence in the instrument's validity. The fit statistics for items (infit and outfit MNSQ values close to 1) confirm that the items performed as expected, capturing the nuances of students' perceptions effectively. This is critical for ensuring that the conclusions drawn from the data are accurate and reflective of the students' true experiences and attitudes towards student-centered learning [28].

By using the Rasch model, a more nuanced understanding of student participation and perceptions was made feasible. It determined the relative difficulty of particular learning components and measured individual differences in students' capacities to participate in student-centered learning. This made it possible to reflect coastal students' opinions about the pedagogical strategy more clearly [25, 24].

#### **4.3 Educational implications**

The findings suggest that student-centered learning approaches are perceived positively by coastal students, aligning with the broader literature on the benefits of these methods. Studies have shown that student-centered learning can lead to increased motivation, better engagement, and improved academic outcomes [29]. For coastal students, who may face unique environmental and socioeconomic challenges, these benefits are particularly significant. When the results of this study are compared to those of comparable urban research, it becomes clear that although urban students have greater access to educational tools, coastal students place more significance on the connection between student-centered learning and environmental issues. While coastal students encounter greater obstacles to resource access, which hinders the full realization of these advantages, both groups report higher levels of involvement and autonomy in student-centered contexts [10, 28]. The high reliability and validity of the instrument used in this study also suggest that it could be a valuable tool for other researchers and educators looking to assess student perceptions in similar contexts. This aligns with calls in the literature for more robust and reliable measures of educational outcomes in diverse settings [20].

To some degree, the cultural expectations of cooperation and problem-solving in coastal communities are in line with student-centered learning. A lot of coastal areas require practical learning methods because of the duties that children have at home and in the local

industries, like fishing. These cultural standards are aligned with the autonomy and relevance of student-centred learning, especially with regard to its focus on practical applications [12]. Furthermore, collaboration and practical skills are highly valued in coastal communities and are essential components of student-centred learning. Students in these areas are required to participate in local businesses like fishing and hospitality, which fit nicely with the practical, problem-solving nature of student-centred learning. The community's cultural ideals of self-sufficiency and flexibility in the face of environmental problems are in line with the autonomy that this strategy fosters.

According to earlier studies, student autonomy and practical relevance promote increased engagement and academic success. These results are consistent with those findings. Particularly those studying around the coast valued the opportunity to apply academic concepts to local concerns like environmental sustainability and economic difficulties [6, 16]. A major factor affecting the effectiveness of student-centred learning in coastal areas is their economic reliance on fishing and other related sectors, given their physical remoteness. Due to less resources available to them, students may have disruptions in their education as a result of environmental incidents. To address these issues, a more flexible teaching style that integrates localized learning modalities is required [12]. Besides, Environmental issues including weather volatility and a lack of sturdy infrastructure make it difficult for students to consistently participate in student-centred learning. These difficulties, in addition to financial limitations, call for adaptable learning approaches that can take into account disruptions in the classroom and scarce resources.

#### **4.4 Challenges and future research**

Although the results are encouraging, they also show that continued assistance and resources are required to guarantee the successful application of student-centred learning strategies. Coastal schools may require additional infrastructure, training, and support to fully realize the benefits of these educational practices [10]. Future student-centred learning initiatives in coastal areas should put an emphasis on expanding access to technology by forming alliances with NGOs and local governments. One can also address the issue of inconsistent internet availability by implementing mobile-based solutions and offline content delivery. Programs for training teachers should also concentrate on providing them with the tools they need to implement student-centred learning in settings with limited resources [30]. The long-term effects of student-centred learning on coastal students, as well as any obstacles which can arise and how to overcome them, should be further investigated in next studies. Longitudinal studies could provide deeper insights into how these approaches affect student outcomes over time and help identify best practices for educators in coastal regions [12].

Collaboration between educators and governments is necessary to address the issues that coastal kids experience, especially in light of their limited access to technology. Lower resource-intensive mobile learning platforms and collaborations with neighborhood organizations to offer low-cost technology solutions are two examples of solutions. Moreover, these problems might be resolved by providing teacher training on the efficient application of student-centered approaches in resource-constrained situations [11, 10]. The long-term effects of student-centred learning on coastal students, as well as any obstacles which can arise and how to overcome them, should be further investigated in next studies. It is also advised to look at how educational technology might enhance student involvement in environments with limited resources and to assess measures meant to upgrade coastal schools' infrastructure.

## 5 Conclusion

The Rasch model analysis indicates that the data from the sample of 28 students at Junior High School Number 10 in Tanjungpinang, Riau Islands Province, fits the Rasch model well. Both person and item reliability indices are high, and the fit statistics are within acceptable ranges. This suggests that the questionnaire used to measure students' perceptions of student-centred learning is both reliable and valid. These findings support the use of this instrument for further research and provide a solid foundation for interpreting the perceptions of coastal junior high school students towards student-centred learning approaches. The limited sample size of 28 students restricts how broadly the results may be applied. However, this study offers insightful information about the opinions of the coastal students that can direct more extensive research in the future. To increase the reliability of the results, larger samples should be used in future research.

The data analysis reveals that coastal junior high school students have a generally positive perception of student-centred learning approaches. The high reliability and validity of the instrument used in this study support its use in similar contexts, providing a valuable tool for educators and researchers. Policymakers and educators must work together to address these issues. The efficacy of student-centered learning approaches in coastal regions could be increased, for instance, by enhancing access to digital resources, offering focused teacher training, and incorporating community-based learning initiatives. These findings contribute to the growing body of literature on the benefits of student-centered learning and highlight the importance of continued support and research to optimize educational practices for coastal students. Long-term implications of this study indicate that although coastal students respond well to student-centered learning, sustained gains in educational outcomes will require ongoing support for teacher preparation programs, technology infrastructure, and curriculum adaptation to local conditions. The coastal students will benefit from investing in these areas as they develop critical thinking and problem-solving abilities, which are essential for tackling the particular difficulties presented by their environment.

## References

1. R. E. Nisbett, *Theory Res. Educ.* **9**, 197 (2011)
2. B. L. McCombs and J. S. Whisler, *The Learner-Centered Classroom and School : Strategies for Increasing Student Motivation and Achievement* (Jossey-Bass Inc., Publishers, San Francisco, 1997)
3. R. de la Sablonnière, D. M. Taylor, and N. Sadykova, *Int. J. Educ. Dev.* **29**, 628 (2009)
4. P. J. Woods and Y. Copur-Gencturk, *Teach. Teach. Educ.* **138**, 104415 (2024)
5. N. Unin and P. Bearing, *Procedia - Soc. Behav. Sci.* **224**, 605 (2016)
6. S. Bell, *Clear. House A J. Educ. Strateg. Issues Ideas* **83**, 39 (2010)
7. D. W. Johnson, R. T. Johnson, and K. A. Smith, *J. Excell. Coll. Teach.* **25**, 85 (2014)
8. A. Bandura, *Self-Efficacy: The Exercise of Control* (1997)
9. G. W. Evans and S. J. Lepore, *Towar. Integr. Theory, Methods, Res. Util.* **4**, 255 (1997)
10. C. C. Cheng and Y. T. Carolyn Yang, *Comput. Educ.* **207**, 104911 (2023)
11. B. Shehata, A. Tlili, R. Huang, M. A. Adarkwah, M. Liu, and T. Chang, *Educ. Inf.*

- Technol. **29**, 7813 (2023)
12. J. Leonard, W. Brooks, J. Barnes-Johnson, and R. Q. Berry, *J. Teach. Educ.* **61**, 261 (2010)
  13. C. K. Chen, N. T. N. Huang, and G. J. Hwang, *Interact. Learn. Environ.* **30**, 949 (2022)
  14. A. Churches, 1 (2000)
  15. M. I. Deunk, A. E. Smale-Jacobse, H. de Boer, S. Doolaard, and R. J. Bosker, *Educ. Res. Rev.* **24**, 31 (2018)
  16. W. Chen, J. S. H. Tan, and Z. Pi, *Int. J. Comput. Collab. Learn.* **16**, 7 (2021)
  17. E. F. Trester, *About Campus Enrich. Student Learn. Exp.* **24**, 13 (2019)
  18. M. L. Penn, C. S. M. Currie, K. A. Hoad, and F. A. O'Brien, *High. Educ. Pedagog.* **1**, 16 (2016)
  19. C. Evans and W. Robertson, *Hum. Behav. Emerg. Technol.* **2**, 269 (2020)
  20. J. W. Creswell and J. D. Creswell, *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*, 5th ed. (SAGE Publications, London, 2018)
  21. A. G. Fink, *How to Conduct Surveys: A Step-by-Step Guide*, 6th ed. (SAGE Publications, London, 2016)
  22. J. Ponto, *J. Adv. Pract. Oncol.* **6**, 168 (2015)
  23. T. Bond and C. M. Fox, *Applying the Rasch Model: Fundamental Measurement in the Human Sciences* (Routledge, New York, 2015)
  24. J. M. Linacre, *A User's Guide to WINSTEPS MINISTEP Rasch-Model Computer Programs* (Winstep.com, 2006)
  25. M. Israel and I. Hay, *Research Ethics for Social Scientists: Between Ethical Conduct and Regulatory Compliance* (SAGE Publications, London, 2006)
  26. W. J. Boone, M. S. Yale, and J. R. Staver, *Rasch Analysis in the Human Sciences* (2014)
  27. B. D. Wright and G. N. Masters, *Rating Scale Analysis in Item Response Modeling Approach* (M E S A Press, San Diego, 1982)
  28. S. Freeman, S. L. Eddy, M. McDonough, M. K. Smith, N. Okoroafor, H. Jordt, and M. P. Wenderoth, *Proc. Natl. Acad. Sci. U. S. A.* **111**, 8410 (2014)
  29. M. Prince, *J. Eng. Educ.* **93**, 223 (2004)
  30. G. W. Evans and S. J. Lepore, *Adv. Environ. Behav. Des.* **IV**, 795 (1997)