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RESEARCH ARTICLE

School engagement and occupational readiness in maritime vocational education: A structural equation modeling approach

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ABSTRACT

According to the most recent national data from the Ministry of National Education, only 40.46% of graduates remain employed in the maritime sector, indicating critically low retention. This study investigates the psychological mechanisms that influence students' intention to remain in the maritime profession after graduation. Data were collected from 366 students enrolled in maritime vocational high schools and analyzed using Structural Equation Modeling (SEM). The model tested two latent constructs: School Engagement and Occupational Readiness. Results revealed that school engagement significantly predicted occupational readiness ($\beta = 0.568$, $p < .001$). The model is theoretically grounded in Bloom's taxonomy, Career Construction Theory, and the concept of Vocational Self-Concept, which together provide a robust framework for understanding how school-based experiences influence students' perceptions of occupational readiness and alignment with the sector. Findings indicate that students' perceptions of their school experience, particularly in terms of the adequacy of vocational knowledge, skills, and attitudes, play a pivotal role in shaping their professional orientation. The model demonstrated strong internal reliability and construct validity, offering a psychometric framework to understand how educational commitment evolves into perceived occupational preparedness. Addressing a notable gap in Turkish maritime education research, this study empirically tests how school engagement influences psychological readiness using a theory-informed SEM design. Such strategies are especially critical for fostering better alignment between students and the maritime profession, potentially supporting future improvements in retention.

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Introduction

Maritime vocational education in Türkiye plays a strategic role in supplying qualified personnel for the national economy and guiding youth toward employment. According to Ministry of National Education (MEB) data, only 40.46% of graduates work in the maritime field, while 37.7% transition into unrelated sectors (MEB, 2020). In the existing literature, maritime vocational education is primarily examined through the lens of technical competencies, language instruction, or internship practices, whereas psychological dimensions that may develop during schooling, such as vocational identity formation and sectoral commitment, have received comparatively limited attention. Structural models that explain the interrelations between internal variables like school engagement, occupational readiness, and vocational identity remain scarce. Yet understanding not only students' cognitive outcomes but also their perceived fit and sense of belonging within the profession is critical to addressing long-term sectoral retention.

This study is based on the assumption that post-graduation retention in the maritime sector is shaped not only by external conditions, but also by the psychological and structural experiences students acquire during their education. Accordingly, the central research question investigates how students' levels of school engagement, occupational readiness, and vocational identity relate to their intention to remain in the sector. To examine these relationships, SEM was employed. The theoretical framework integrates Bloom's taxonomy of cognitive, affective, and psychomotor domains, Bandura's Social Cognitive Theory, and Lave & Wenger's Situated Learning Theory. The proposed model aims to holistically explain the student's educational journey along a trajectory of engagement, readiness, identity, and retention.

Specifically, school engagement and occupational readiness emerge as key drivers of students' professional orientation. Prior theoretical frameworks suggest that these constructs may contribute to vocational identity development and long-term sectoral retention (Super, 1980; Allen & Meyer, 1990; Eccles & Wigfield, 2002; Savickas, 2005).

Literature Review

Research on maritime vocational education in Türkiye identifies persistent structural and pedagogical issues that affect student commitment and long-term sectoral retention. Field selection is often guided by family influence rather than intrinsic motivation (Fidan & Nas, 2019), and graduates continue to face significant challenges in terms of practical readiness and English proficiency, which hinder international employability (Başkol, 2019; Saray, 2020). Although Turkish programs comply with Standards of Training Certification and Watchkeeping (STCW), instructional quality remains questionable due to the widespread absence of seafaring certification among teachers (Öztürk et al., 2020). Misalignment between vocational curricula and industry needs is another well-documented concern (MEB, 2021a; Kılıç, 2022).

Sectoral Retention and Vocational Mismatch in Maritime Education

A substantial body of both national and international research highlights a persistent misalignment between maritime vocational education and actual employment outcomes in the maritime sector. For instance, the most recent data from the Ministry of National Education (MEB, 2020) reveal that only 40.46% of maritime vocational high school graduates in Türkiye are employed in the sector, while 37.7% transition into unrelated professions. This issue appears to stem not only from labor market dynamics but also from fundamental structural shortcomings within the educational system.

According to the MEB's E-Mezun 2020 report, 74.02% of vocational high school graduates who actively sought employment were able to find their first job within six months after graduation. However, 87% of these employed graduates earned wages at or below the minimum wage level (MEB, 2020). This pattern is not merely an economic outcome but also reflects a psychological adaptation to structural labor market constraints. As suggested by Gitlin (2001), individuals may choose to accept precarious or underpaid jobs primarily to avoid the stigma and uncertainty of unemployment. In this context, the high rate of employment should be interpreted with caution, as it may mask deeper issues of vocational mismatch and systemic inefficiencies within the training-to-work transition. Further insight is offered by Kablay's (2021) qualitative and descriptive case study, which reveals that 95% of students were assigned to vocational programs involuntarily due to low academic performance. Most did not intend to pursue a career in their trained field and expressed disappointment during internships, indicating a lack of identification with their area of study.

Moreover, findings from the MEB (2021b) also follow a descriptive format, showing that only 4.7% of vocational graduates secure employment in the public sector, and employers have become increasingly reluctant to hire

vocationally trained individuals. According to the same report and supported by Kablay (2021), 47.1% of graduates believe their training does not contribute meaningfully to their professional lives.

This concern is echoed in Yılmaz's (2018) survey-based descriptive study of 652 Turkish seafarers, where 59.8% of respondents under the age of 24 stated they would leave maritime work if land-based alternatives were available. For those aged 25–44, the figure rises to 68%. Among support staff, only 35% regarded their training as sufficient preparation for their occupational duties.

A study by Karaoğlu et al. (2023), which conducted a descriptive content analysis of 21 associate degree programs in Türkiye and Northern Cyprus, found that maritime education curricula often fail to include essential topics such as logistics, foreign trade, and maritime English. This curricular inadequacy is considered a central factor contributing to low sectoral retention.

Additionally, Yorulmaz et al. (2022) identified inadequate training, professional burnout, and dissatisfaction as key human factors contributing to turnover in port operations. Although the study includes analytical weighting through AHP, its foundational findings reflect recurring descriptive concerns about maritime workforce challenges.

Lastly, Güzel's (2021) doctoral dissertation at Istanbul Technical University presents a mixed-methods assessment but includes strong descriptive elements when reporting institutional deficiencies. The study states that despite the increasing number of maritime training institutions, graduates still face substantial challenges in securing internships and employment. Türkiye's share of global maritime employment remains below 1%, and 40% of institutions fall short of meeting basic quality standards.

Taken collectively, these findings suggest that sectoral retention is shaped not merely by market conditions but also by a complex interplay of factors, including voluntary program selection, curriculum quality, guidance systems, and the psychological development of professional identity.

Research Gap and Contribution

Recent studies on vocational orientation have increasingly emphasized psychological dimensions such as institutional support, career motivation, and identity development (Yıldırım et al., 2022; Melović et al., 2022; Senbursa, 2023; Yıldız, 2023). However, in the field of maritime vocational education, most existing research tends to focus on topics evaluated primarily at the applied level, relying heavily on descriptive analysis. There is a notable lack of theory-driven studies that test causal relationships among psychological constructs. Existing research often emphasizes themes such as curriculum adequacy (Karaoğlu et al., 2023), internship satisfaction (Kablay, 2021), employment mismatch (Yılmaz, 2018; Yorulmaz et al., 2022), and institutional deficiencies (Güzel, 2021), but rarely investigates how school-based psychological experiences shape post-graduation sectoral retention.

This growing emphasis on the psychosocial aspects of vocational orientation has revealed a theoretical gap in addressing the widely observed employment mismatch in maritime vocational education.

In response to this gap, the present study tests the relationship between maritime vocational high school students' school engagement and their occupational readiness within a theory-informed system framework constructed through Structural Equation Modeling (SEM). This approach offers a comprehensive structure for explaining the interrelations among psychological variables that influence sectoral retention. To the best of the authors' knowledge, no prior study has tested a theoretical SEM model linking these two constructs specifically within the context of maritime vocational education.

Material and Methods

Population and Sample

This study focused on 10th to 12th-grade students enrolled in Maritime Vocational High Schools in Türkiye during the 2023–2024 academic year. The target population comprised 8,390 students from Deck Management and Marine Engineering tracks. Cluster sampling was applied to select students from Istanbul, Izmir, Muğla, and Antalya, which are the regions with the highest concentration of maritime students. After excluding incomplete responses, the final sample consisted of 366 students. Grade-level distribution is presented in Table 1.

Sample adequacy was assessed through multiple criteria. Based on Comrey & Lee (1992), a sample of 300 is "good" for multivariate analysis; Hair et al. (2010) further recommends 5–10 participants per item for factor analysis. With 28 items, the sample size meets both criteria. Additionally, power analysis using RMSEA thresholds (MacCallum et al., 1996) confirmed adequacy: for 289 degrees of freedom, a sample of 250–400 ensures 0.80 power at $\alpha = 0.05$, detecting RMSEA between 0.05 and 0.08. Therefore, the sample is statistically sufficient for CFA and SEM procedures used in this study.

Table 1. Research population and sample

Variable	Categories	N	%
Research Population	All maritime high school students (Türkiye)	8390	100.0
Sample	Students from 4 selected provinces	366	4.36
Grade Level	10th Grade	117	32.0
	11th Grade	156	42.6
	12th Grade	93	25.40

Instrument Development

The measurement instrument used in this study is a structured questionnaire composed of 28 items designed to assess students' perceptions of their maritime vocational education, school engagement, occupational readiness, and career aspirations. (See Appendix A, Table A1 for the complete item list.) The instrument includes both multiple-choice items for demographic and descriptive purposes and 5-point Likert-type scale items for latent construct measurement. The questionnaire was developed through a hybrid process that combined item adaptation from national sources with original item development based on established educational theories. Specifically, 11 items (Items 1–11) were adapted from the 2020 "E-Mezun" Research Report published by the Turkish Ministry of National Education. This national report presents the most recent large-scale data available on vocational education graduates' employment outcomes and sectoral alignment in Türkiye. Although the E-Mezun report is not a psychometric scale, it provides policy-relevant and thematically structured content regarding students' experiences, including satisfaction with vocational education, perceptions of internships, readiness for employment, and career planning. These themes were reworded into student-centered Likert-type items and restructured to reflect the perspectives of current students enrolled in vocational programs rather than graduates recalling past experiences. The remaining 17 items were newly developed to address areas not fully covered by the adapted content and to align with the specific theoretical and contextual scope of the present study. Item construction was guided by Bloom's Taxonomy of Learning Domains (Bloom et al., 1956), Social Cognitive Career Theory (Lent et al., 1994), and Situated Learning Theory (Lave & Wenger, 1991). These items aimed to capture cognitive, emotional, and behavioral indicators of school engagement, professional identity, and career readiness in the maritime vocational education context. To ensure the content validity and clarity of the questionnaire items, expert opinions were obtained from five professionals with over ten years of experience working with maritime vocational students. The expert panel included: (1) a school counselor specialized in psychological guidance, working in a maritime high school for more than a decade; (2) a senior deck instructor who is also a licensed first-class captain and a teacher; (3) a vocational teacher of deck operations; (4) a vocational teacher in maritime engineering (machinery); and (5) a university lecturer holding a PhD in maritime transportation and management engineering. This diverse panel provided feedback from both practical and academic perspectives, ensuring the instrument's appropriateness for the target population. Based on expert feedback, minor revisions were made to improve item clarity and eliminate redundancy. Content Validity Index (CVI) values for all items exceeded the accepted threshold of .80 (Polit & Beck, 2006), supporting the overall content validity of the instrument. This process ensured that the final instrument reflects both contextual relevance and theoretical integrity within the maritime vocational education domain.

Data Collection and Preliminary Screening

Data were collected online via Google Forms during the 2023–2024 academic year to ensure accessibility and efficiency. Participation was voluntary and anonymous; informed consent was obtained digitally. The study adhered to all ethical standards and involved no intervention. The aim was to explore students' perceptions of how well maritime vocational education prepares them for sectoral employment.

Before conducting multivariate analyses, the dataset was screened for missingness and normality. Little's MCAR test confirmed that missing data were random ($p = 0.984$), supporting the use of the Expectation-Maximization (EM) algorithm for imputation. One item (m12) with excessive missing values was excluded. Item m16 was reverse-coded to ensure directional consistency. As shown in Table 2, skewness and kurtosis values indicated that most items exhibited acceptable distribution characteristics, confirming the dataset's suitability for EFA, CFA, and SEM.

Table 2. Skewness and kurtosis ranges and distribution interpretations of items

Skewness / Kurtosis Range	Items	Interpretation
Skewness between -1 and +1 Kurtosis between -1 and +1	m4, m8, m9, m10, m11, m13, m14, m17, m18, m21, m22, m23, m11, REGR factor 1	Normal distribution, excellent skewness and kurtosis.
Skewness between ±1 and ±2 Kurtosis between -1 and +2	m1, m2, m7, m15, m16, m19, m20, m24, REGR factor 2	Mild to moderate positive skew, acceptable kurtosis.
Skewness > +2 Kurtosis > +2	m6	Substantial positive skewness and kurtosis; non-normal distribution.
Special Note	m16 was reverse-coded before analysis.	

Table 3. Eigenvalues, explained variance, and item loadings for each factor

| Factor	Eigenvalue	% of Variance	Cumulative %	Items (and Loadings)
1	5.986	42.76%	42.76%	m1 (0.884), m2 (0.869), m3 (0.839), m4 (0.832), m5 (0.827), m8 (0.784), m9 (0.773), m10 (0.753)
2	2.036	14.54%	57.30%	m6 (0.845), m7 (0.822), m19 (0.756), m20 (0.742), m21 (0.715), m22 (0.694)

Exploratory Factor Analysis (EFA)

An exploratory factor analysis (EFA) was conducted on 24 Likert-type items, excluding nominal and categorical variables. The Kaiser-Meyer-Olkin (KMO) value of 0.895 and significant Bartlett's Test (χ^2 = 2468.437, df = 91, p < 0.001) confirmed the data's suitability for factor analysis (Hair et al., 2010). An iterative procedure removed items with low factor loadings (< .40) or cross-loadings (> .30). Based on the eigenvalue > 1 criterion and Scree Plot inspection (Kaiser, 1960; Cattell, 1966), a two-factor structure was retained, explaining 57.30% of the total variance, 42.76% by Factor 1 and 14.54% by Factor 2. This exceeds the 50% benchmark considered adequate in perception and behavior studies (Worthington & Whittaker, 2006; Tabachnick & Fidell, 2013). All retained items (See Appendix A, Table A2 for the item list.) loaded strongly onto their respective factors (0.694–0.884), exceeding the 0.60 threshold recommended for large samples (Stevens, 2002). Promax rotation was applied, assuming factor correlation. As illustrated in the scree plot (Figure 1) and detailed in Table 3, a two-factor structure emerged, explaining 57.30% of the total variance. This structure provided empirical support for proceeding to Confirmatory Factor Analysis (CFA).

Confirmatory Factor Analysis (CFA) Process

Confirmatory Factor Analysis (CFA) was conducted using AMOS 30 software to test the construct validity of the measurement model. During the transition from EFA to CFA,

items m1, m4, m6, and m7 were removed to enhance clarity and avoid cross-loadings, resulting in a more coherent structure. Initially, a two-factor structure based on Exploratory Factor Analysis results was specified (CFA1), which demonstrated strong fit indices (see Table 4). The residual covariances identified in this model enhanced theoretical coherence; however, the overall structure also required balancing with the principle of parsimony.
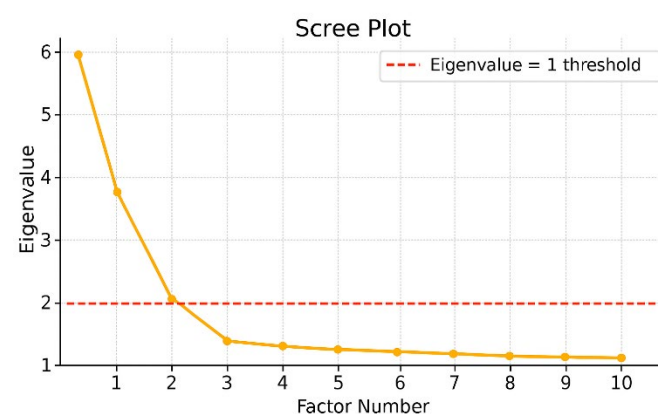
Figure 1. Scree plot indicating the two-factor solution based on eigenvalues

Therefore, a more parsimonious alternative model (CFA2) was developed by retaining only theoretically justifiable residual covariances based on item content and semantic similarity. The CFA2 model also achieved satisfactory fit indices, offering a defensible and efficient measurement structure (see Table 4).

Table 4. Fit indices of CFA models

Model	χ2/df	RMSEA	CFI	TLI	SRMR
CFA 1	2.342	0.066	0.935	0.923	0.0434
CFA 2	2.771	0.070	0.967	0.950	0.0457

Two sets of error covariances were specified in CFA2. The first involved items md8 ("I find the professional knowledge/theory we acquire beneficial"), md9 ("I find the professional skills/practice we acquire beneficial"), and md10 ("I find the professional attitudes, work habits, and values we acquire beneficial"). These items reflect Bloom's cognitive, psychomotor, and affective domains, respectively. Their conceptual proximity, common phrasing, and sequential presentation may have led to residual correlations between their error terms (e8, e7, e12), which are considered localized measurement dependencies rather than structural misfit (Brown, 2015; Kline, 2016). The second group of residual covariances involved items m19 and m21, which assess students' perceived readiness for professional life. These items are conceptually aligned and presented consecutively. High modification indices suggested by AMOS and content similarity justified the specification of residual covariances between their corresponding error terms (e1–e2). CFA2 was adopted as the final measurement model for SEM (Figure 2). All retained items loaded strongly onto their respective factors (Table 5), based on methodological guidelines by Hair et al. (2010), Kline (2016), and Brown (2015), ensuring clarity and minimizing cross-loadings.

Construct Validity, Reliability Assessment and Discriminant Validity Assessment Fornell–Larcker Criterion

The model's convergent validity and composite reliability were assessed using Average Variance Extracted (Eq. 1) and Composite Reliability (Eq. 2):

$$AVE = \frac{\Sigma(\lambda_i^2)}{n} \tag{1}$$

$$CR = \frac{(\Sigma \lambda_i^2)}{\Sigma \lambda_i^2 + \Sigma \varepsilon_i} \tag{2}$$

where λ_i denotes the standardized factor loading for item i, and ε_i denotes its corresponding error variance in Table 5) values calculated from the Confirmatory Factor Analysis (CFA) results. According to Fornell & Larcker (1981), AVE values above 0.50 indicate acceptable convergent validity. Additionally, Hair et al. (2010) recommend CR values greater

than 0.70 to demonstrate sufficient internal consistency. For the School Engagement factor, the AVE value was slightly below the threshold (0.459), but the high CR value (0.843) compensates for this, indicating acceptable convergent validity as suggested in the literature (Hair et al., 2010; Malhotra & Dash, 2011).
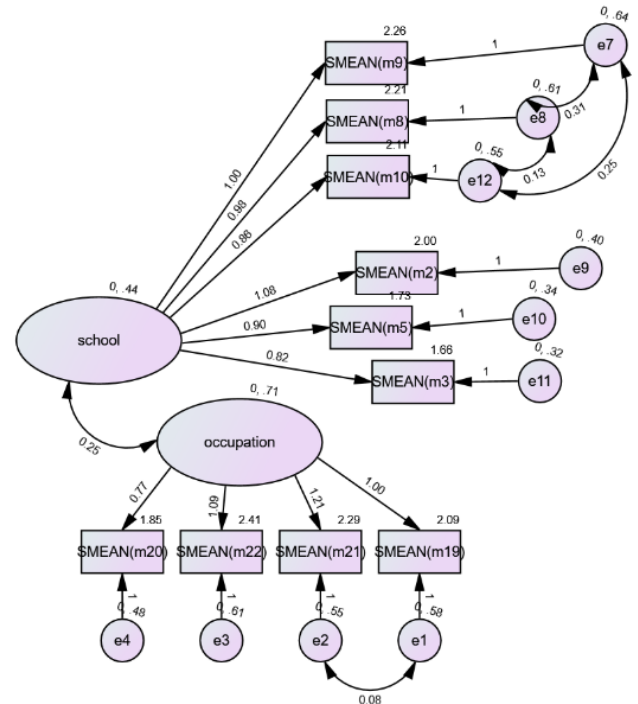
Figure 2. Standardized CFA path diagram representing the final model

Discriminant validity was evaluated using the Fornell–Larcker criterion, which requires the square root of the AVE for each construct ($\sqrt{AVE_i} > r_{ij}$, where $\sqrt{AVE_i}$ denotes the square root of the Average Variance Extracted for construct i, and r_{ij} is the correlation coefficient between constructs i and j.) to exceed the correlation with any other construct (Fornell & Larcker, 1981). As shown in Table 6, the model meets these thresholds for both constructs.

Model Development through Structural Equation Modeling

Structural Equation Modeling (SEM) was conducted using IBM SPSS AMOS v30 to test the consistency of the factor structure with the theoretical model. The latent-variable relationships were modeled based on the previously confirmed factor structure, and three SEM models were tested sequentially following the guidelines of Kline (2016) and Byrne (2010).

Table 5. Standardized loadings, error variances, and squared loadings of CFA model items

Factor	Item	Std. Loading (λ)	Error Variance (ε)	Squared Loading (λ^2)
Occupational Readiness	md19	0.743	0.577	0.552
Occupational Readiness	md21	0.811	0.547	0.658
Occupational Readiness	md22	0.763	0.607	0.582
Occupational Readiness	md20	0.685	0.477	0.469
School Engagement	md5	0.718	0.639	0.516
School Engagement	md3	0.694	0.610	0.482
School Engagement	md2	0.751	0.605	0.564
School Engagement	md9	0.640	0.339	0.410
School Engagement	md8	0.639	0.320	0.408
School Engagement	md10	0.613	0.546	0.376

Note: All standardized loadings are significant at p < .001.

Table 6. Construct validity, reliability, and discriminant validity results based on the Fornell–Larcker criterion

Construct	AVE	CR	$\sqrt{AVE}$	Inter-Construct Correlation	Discriminant Validity
School Engagement	0.459	0.843	0.678	0.451	Met
Occupational Readiness	0.565	0.803	0.752	0.451	Met

Results

Construct Validity and Reliability Results

The School Engagement factor represents students' perceptions of their cognitive, affective, and psychomotor development. Items m2, m3, and m5 assess institutional support and satisfaction, while m8, m9, and m10 evaluate the adequacy of vocational knowledge, skills, and attitudes. These dimensions align with Bloom's taxonomy and the construct showed high reliability (CR = .843). Although the AVE value was slightly below the conventional threshold (.459), it was deemed acceptable in line with Hair et al. (2010) and Malhotra & Dash (2011), given the high CR.

The Occupational Readiness factor measures students' psychological preparedness, including career fit, future orientation, and proactive behaviors (items m19–m22). This structure is grounded in Career Construction Theory (Savickas, 2005) and Vocational Self-Concept (Super, 1980), and satisfies all validity criteria (CR = .803; AVE = .565).

SEM Analysis Findings

To assess the alignment between the theoretical model and observed data, three structural equation models (SEM1, SEM2, SEM3) were tested. As shown in Figure 3, model fit improved across stages, with SEM3 demonstrating excellent fit (Hu &

Bentler, 1999). Minor modifications were made based on modification indices, all below the threshold of 10. All path coefficients were statistically significant, and the final model is presented in Figure 4, with fit indices in Table 7. Residual covariances were limited and conceptually justified. Items m8, m9, and m10 were linguistically similar and shared overlapping theoretical domains (Bloom), while m19–m22 reflected a cohesive vocational self-image. These were identified through modification indices (MI < 10) and align with best modeling practices (Byrne, 2010; Brown, 2015).
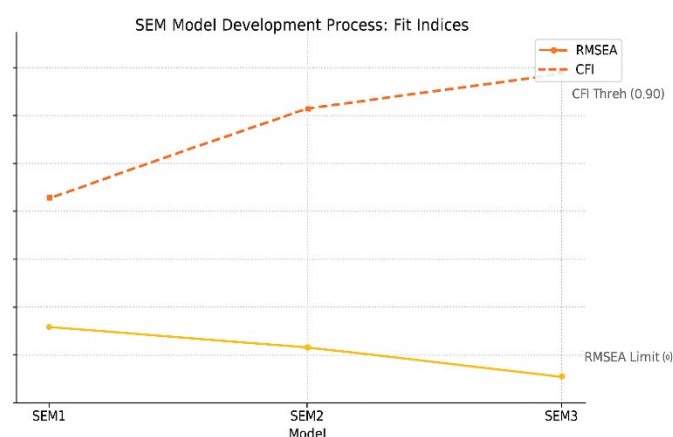

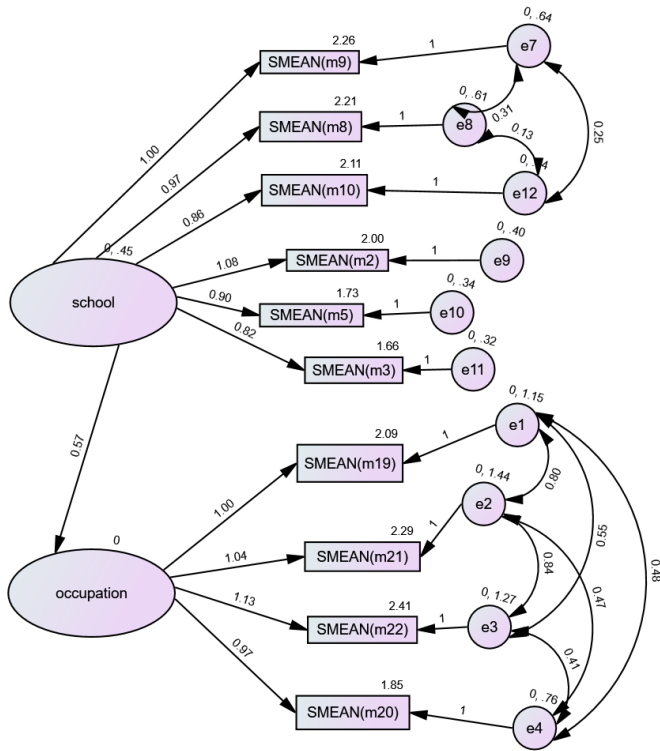**Figure 3.** Fit indices across SEM model development stages (SEM1–SEM3)

Figure 4. Final structural equation model with standardized path coefficients

Table 7. Model fit indices and recommended thresholds

Fit Index	Value	Acceptable Threshold (Hu & Bentler, 1999; Kline, 2016)
χ^2/df	2.065	< 3 (acceptable)
CFI	0.983	> .90 (good fit)
TLI	0.97	> .90 (good fit)
RMSEA	0.054	< .06 (excellent)
PCLOSE	0.348	> .05 (good fit)
Hoelter (.05)	265	> 200 (acceptable)

A unidirectional path was modeled from School Engagement to Occupational Readiness (β = .568, p < .001). Observed variables m2, m3, m5, m8, m9, and md10 loaded onto School Engagement, while m19, m20, m21, and m22 loaded onto Occupational Readiness. Factor loadings ranged from .617 to .750 for School Engagement and .690 to .810 for Occupational Readiness, consistent with the previously confirmed CFA structure and supporting the measurement model's validity. SEM3 was retained as the final model due to its statistical adequacy and theoretical structure (see Figure 4).

The path from School Engagement to Occupational Readiness was both statistically significant (β = .568, p < .001)

and theoretically consistent. Students who perceive their schooling as meaningful and supportive are more likely to feel ready for a maritime career. The final model displayed excellent fit indices (see Table 7). The SEM results empirically validate the hypothesized pathway from school engagement to occupational readiness, reinforcing the study's theoretical framework.

Discussion

This study was designed in response to a structural problem in Türkiye's maritime vocational education: although thousands of students graduate annually, only 40% remain in the sector (MEB, 2020). While existing research typically focuses on curriculum or technical skills, (e.g., Kılıç, 2022; Karaoğlu et al., 2023) the psychological experiences of students during their education, such as vocational identity and sectoral commitment, remain largely underexamined in the Turkish maritime education context (Güzel, 2021; Yıldız, 2023). Our study addresses this gap by applying a structural equation model (SEM) that incorporates psychosocial constructs to explain how school engagement predicts occupational readiness.

The constructs assessed in the model reflect both institutional and psychological aspects of student experience, forming a comprehensive foundation for understanding career readiness in maritime education.

Theoretical Contribution and Policy Implications

To the best of the authors' knowledge, this model is among the first empirical efforts in Türkiye to statistically explain how school engagement influences psychological preparedness and long-term sectoral retention in maritime vocational education. It bridges the gap between vocational training and employment outcomes. While previous studies have explored institutional barriers or student dissatisfaction descriptively (e.g., Yorulmaz et al., 2022; Yıldız, 2023), few have adopted a validated theoretical model that quantitatively links school engagement to long-term sectoral commitment.

These findings suggest several actionable directions for policy, including the implementation of psychological readiness assessments during student enrollment, the development of engagement-focused pedagogical strategies, and the promotion of student–profession alignment mechanisms throughout the educational process. These measures may help vocational education move beyond

graduation metrics toward sustaining a skilled and committed maritime workforce.

Conclusion

This study was grounded in a well-documented national challenge: the low sectoral retention rate among graduates of maritime vocational high schools in Türkiye, with only 40.46% employed in the maritime industry despite years of specialized training. Recognizing that this pattern cannot be fully explained by labor market conditions or individual choices alone, we aimed to explore the internal psychological mechanisms formed during schooling that influence post-graduation career outcomes.

Using SEM, we developed and validated a theory-informed model that revealed a significant predictive pathway from School Engagement to Occupational Readiness. The findings indicate that students' perceptions of their school experience, including the perceived adequacy of vocational knowledge, skills, and attitudes, appear to play a significant role in shaping their confidence and motivation for entering the maritime sector. These results move beyond conventional explanations and emphasize that dropout from the profession often originates from misalignments experienced during schooling, not only after graduation.

Practically, the study underscores the need for pre-enrollment diagnostic tools to assess students' psychological and motivational readiness. Improving student–program matching at the outset may reduce the number of graduates who later leave the field due to incompatibility or lack of self-efficacy. In addition, pedagogical reforms that enhance school engagement, including practices such as mentoring, hands-on simulations, and industry-linked curricula may contribute meaningfully to building students' occupational readiness.

The model also contributes significantly to the literature by empirically linking educational experience with long-term vocational behavior through latent psychological constructs. In contrast to existing studies that focus on surface-level curriculum or internship quality, our study proposed a validated mechanism that policy-makers and educators may consider when designing interventions. Maritime vocational training programs, could benefit from being restructured to cultivate not only technical competence but also professional identity emotional alignment, and perceived sectoral fit.

In sum, this research reconceptualizes vocational education not merely as a skill-transmission process, but as a formative ecosystem that builds occupational identity and sectoral commitment. The transition from School Engagement to Career Readiness should be viewed as a critical juncture in the long-term retention of maritime professionals. The study presents a theory-informed model that seeks to bridge education and employment, contributing to a broader understanding of workforce sustainability in vocational contexts.

Limitations and Further Research Directions

The study was limited to vocational maritime schools in four coastal provinces of Türkiye, which may restrict generalizability to other regions or educational contexts. Data collection relied on an online survey, potentially excluding students without adequate internet access. Future studies should employ broader and more diverse samples and consider longitudinal or intervention-based research designs to validate and extend the current findings.

This study empirically examined how vocational maritime high school students' school engagement predicts their occupational readiness. Future research may consider extending this validated pathway based on well-established theoretical frameworks such as Career Construction Theory (Savickas, 2005), Organizational Commitment Theory (Allen & Meyer, 1990), and Expectancy-Value Theory (Eccles & Wigfield, 2002). These frameworks collectively may support a potential developmental pathway, such as School Engagement → Career Readiness → Vocational Identity → Sectoral Retention. Such a proposed sequence could be explored in future research to offer deeper insights into not only how students respond to education, but also how they construct professional identities and develop long-term sectoral commitment. Accordingly, longitudinal designs, intervention-based experimental studies, and cross-cultural validations are recommended for future research to empirically test this extended sequence.

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Compliance With Ethical Standards

Authors' Contributions

GGB: Conceptualization, Data curation, Formal analysis, Writing – original draft

GE: Supervision, Writing – review & editing

All authors read and approved the final manuscript.

Conflict of Interest

The authors declare that there is no conflict of interest.

Ethical Approval

This study was approved by the Istanbul University-Cerrahpaşa Social and Human Sciences Research Ethics Committee with decision number 2022/338 and was conducted in accordance with the 1964 Declaration of Helsinki and its subsequent amendments or comparable ethical standards.

Funding

Not applicable.

Data Availability

All results are fully presented in the manuscript. However, the raw data are not publicly available but can be provided by the corresponding author upon reasonable request.

AI Disclosure

Generative AI (ChatGPT 3.5) was used for grammatical review of the introduction and discussion sections. The authors validated all outputs and assume full responsibility for the content.

Supplementary Materials

Supplementary data to this article can be found online at https://doi.org/10.33714/masteb.1697022

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