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INFLUENCE OF GENDER, SELF-EFFICACY BELIEFS, AND WORK ORIENTATIONS ON STUDENTS' AND GRADUATES' PERCEPTIONS OF THE RELEVANCE OF THE MARITIME EDUCATION AND TRAINING (MET) MATHEMATICS CURRICULUM

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ABSTRACT

In Maritime Education and Training (MET), where mathematics underpins engineering competence, navigational safety, and technological problem-solving, understanding how individual characteristics influence perceptions of relevance is critical for effective curriculum development and student engagement. This study examines the influence of gender, mathematics self-efficacy beliefs, and work orientations on students' and graduates' perceptions of the relevance of the MET mathematics curriculum, using the Marine Engineering programme at the Regional Maritime University (RMU), Ghana, as a case study. Drawing on social cognitive theory, expectancy–value theory, and employability-oriented curriculum discourse, the study synthesizes empirical evidence from students and graduates and situates the findings within global research on engineering, mathematics, and vocationally oriented higher education. The findings indicate that gender differences do not significantly influence perceptions of curriculum relevance, whereas mathematics self-efficacy beliefs and work orientations play more substantial roles in shaping how mathematics is valued for academic progression and professional practice. The findings underscore the importance of viewing curriculum relevance as a psychologically mediated construct rather than a purely structural attribute of curriculum design. Learners interpret curriculum experiences through the lenses of confidence, motivation, and career aspiration, and these interpretations ultimately determine perceived relevance. The study argues that enhancing perceived relevance of MET mathematics requires pedagogical and curricular strategies that strengthen learner confidence, make utility value explicit, and align mathematical learning with diverse academic and occupational orientations within the maritime sector.

Keywords: MET mathematics, self-efficacy, gender, work orientation, curriculum relevance, marine engineering education

1.0 INTRODUCTION

Mathematics occupies a central position in engineering education and remains a foundational discipline within Maritime Education and Training (MET). In marine engineering programmes, mathematical knowledge supports a wide range of competencies, including analytical reasoning, systems modelling, thermodynamics, fluid mechanics, structural analysis, control systems, and technological problem-solving essential to maritime operations. International standards, such as the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW), implicitly rely on mathematical competence as a basis for engineering judgment, safety assurance, and operational efficiency.

Gender remains a persistent theme in discussions of mathematics and engineering education. Historically, engineering and maritime professions have been dominated by men, and gendered narratives about mathematical ability and technical competence continue to influence educational experiences globally. Research indicates that female students often report lower confidence in mathematics despite achieving performance levels comparable to their male peers (Dweck, 2007). In MET institutions such as RMU, female participation in marine engineering remains relatively low, reflecting broader structural and cultural barriers within the maritime sector. These realities raise important questions about whether gender influences how mathematics curricula are perceived and valued.

Despite its acknowledged importance, mathematics is frequently perceived by students and graduates as abstract, difficult, and insufficiently connected to real-world maritime practice. Studies across engineering and vocational higher education reveal persistent concerns regarding the relevance of mathematics curricula to professional demands (Bok, 2006; van den Akker, 2003). In MET institutions, where programmes are explicitly career-oriented and industry-regulated, such perceptions may undermine student motivation, engagement, and long-term competence development.

Much of the existing literature on curriculum relevance in engineering education focuses on curriculum alignment, industry needs, pedagogical innovation, and competency-based education. While these structural and institutional factors are undeniably important, they do not fully explain why learners exposed to the same curriculum often develop markedly different perceptions of its relevance. Educational psychology suggests that learner-related characteristics—such as beliefs about ability, motivation, identity, and career orientation—play a crucial mediating role in how curriculum experiences are interpreted and valued (Bandura, 1997; Eccles & Wigfield, 2002).

Understanding perceptions of curriculum relevance requires an integrative theoretical framework that accounts for both individual cognition and socio-contextual influences. This study draws primarily on social cognitive theory, expectancy–value theory, and work-orientation perspectives within employability-oriented curriculum discourse. Social cognitive theory emphasizes the reciprocal interaction between personal factors, behavior, and environmental influences in shaping learning outcomes (Bandura, 1997). Central to this theory is the concept of self-efficacy, defined as individuals' beliefs in their capabilities to organize and execute actions required to achieve specific goals.

Mathematics self-efficacy refers specifically to learners' confidence in their ability to understand, apply, and succeed in mathematical tasks. Extensive research demonstrates that self-efficacy is a powerful predictor of academic engagement, persistence, achievement, and resilience in the face of difficulty (Schunk, 1989). Learners with high mathematics self-efficacy are more likely to:

- Engage actively with challenging problems

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- Attribute difficulties to controllable factors such as effort or strategy
- Persist in demanding courses and professional pathways

Conversely, learners with low self-efficacy often experience anxiety, avoidance, and negative affect, which can distort perceptions of curriculum relevance. Even when mathematical content is objectively valuable, students with low confidence may perceive it as irrelevant, excessively theoretical, or disconnected from practice. In engineering education, such perceptions can have long-term consequences for competence development and professional identity formation. According to Eccles and Wigfield (2002), learners' engagement with academic tasks is determined by their expectations of success and the subjective value they attach to those tasks. Subjective task value includes several components, of which utility value (the perceived usefulness of a task for future goals) is particularly relevant in professional and vocational programmes. In MET and marine engineering education, students often evaluate curriculum relevance through the lens of future employability, certification requirements, and workplace performance. When mathematics is perceived as instrumental to academic progression, professional competence, or career advancement, learners are more likely to value it and invest effort. Conversely, when utility value is unclear or poorly articulated, motivation and perceived relevance decline, regardless of the curriculum's intrinsic importance.

Work orientation refers to individuals' underlying assumptions about the purpose of education in relation to employment and life goals. In higher education research, work orientation is often conceptualized along a continuum that includes:

i. Academic orientation, emphasizing intellectual development, theoretical understanding, and long-term educational progression
ii. Vocational orientation, emphasizing immediate job readiness, practical skills, and direct workplace applicability
iii. Hybrid orientation, integrating academic and vocational values

1.1 Problem Statement

Within this context, three learner-related factors warrant particular attention: gender, mathematics self-efficacy beliefs, and work orientations. Gender remains a salient issue in engineering and maritime education, fields that have historically been male-dominated and culturally associated with masculine identities. Mathematics self-efficacy influences learners' confidence, persistence, and interpretation of difficulty, while work orientation shapes how students and graduates evaluate the usefulness of academic knowledge in relation to employment and career trajectories. This study, therefore, investigated how gender, self-efficacy beliefs, and work orientations influence students' and graduates' perceptions of the relevance of the MET mathematics curriculum, using the Marine Engineering programme at the Regional Maritime University (RMU), Ghana, as an empirical context.

1.2 Research Objectives

The following specific objectives guided the study:

i. To examine whether gender differences influence students' and graduates' perceptions of the relevance of MET mathematics curriculum.

ii. To determine the extent to which mathematics self-efficacy beliefs predict perceptions of the MET mathematics curriculum.
iii. To investigate how work orientations influence students' and graduates' perceptions of the relevance of MET mathematics curriculum.

1.3 Hypothesis

Ho1: There is no significant difference between the self-efficacy belief categories in their perception of the relevance of the MET mathematics curriculum.

Ho2: There is no significant difference between participants in engineering and their counterparts in non-engineering professions in their perception of the relevance of the MET mathematics curriculum.

1.4 Significance of the study

By foregrounding psychological and socio-cultural dimensions of curriculum relevance, the study contributes to ongoing debates on improving the effectiveness, inclusivity, and employability orientation of MET mathematics curriculum design and education.

2.0 LITERATURE REVIEW

Whether students view their mathematics performance as a gift or something that can be developed by hard work can influence their interest in the subject (Dweck, 1999). If students view mathematics ability as a fixed ability that they either possess (i.e., were born with) or do not possess, they are more likely to lose interest when they encounter difficulty with mathematics. If students view mathematics ability as something that can be developed through study and by seeking additional resources and assistance when they feel challenged, they maintain an interest in mathematics despite difficulties or obstacles (Dweck, 1999). While this same pattern may occur in relation to other subjects, Dweck (2007) believes that negative gender stereotypes about female interest in mathematics work in tandem to diminish pursuit of mathematics skills among females.

Lack of interest in mathematics has direct implications for student involvement in areas that require a strong mathematics background, including science, technology, engineering and mathematics (STEM) disciplines and careers, particularly for females. Lower interest is closely related to lower performance on mathematics -related achievement tests and lower grades in mathematics (Betz, 1978; Singh, Granville, & Dika, 2002; Uerz, Dekkers, & Beguin, 2004), less interest in taking challenging mathematics curricula prior to enrolling in college (Nosek et al., 2002), and less interest in pursuing a career in STEM disciplines (Usher, 2009). Females express less interest in mathematics than male peers and some studies link that lower interest to fewer females pursuing careers in STEM fields (Betz, 1978; Usher, 2009). Tobias (1989) shows that girls may have less interest in mathematics than boys do because of the ways teachers communicate with students, often interacting more with boys than with girls during mathematics lessons. When girls ask for help, the teacher is more likely to solve the issue at hand, leaving girls to learn by watching rather than by doing. Conversely, teachers explain to boys how to do mathematics and guide them through the learning experience. Teachers should involve all students in hands-on, inquiry-based activities to increase mathematics interest,

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which could motivate both male and female students to pursue STEM-based activities and additional education and careers in these areas (Tobias, 1989).

These trends present a confusing picture of females and mathematics. Competing statistics have been reported, and research has focused on identifying experiences that might explain the lack of interest among females despite the fact that they and males demonstrate equal aptitude for mathematics (Spelke, 2005). To that end, Spelke (2005) found that sociocultural factors play a major role in students' perceptions about the degree to which females and males are good at mathematics and the utility of studying the subject. Negative views held by influential individuals such as parents and teachers underscore these messages and are internalized by girls, negating their interest in mathematics. When considering the long-term impact, lack of interest in mathematics among girls is directly related to fewer women pursuing degrees in math-related careers, including science, technology, and engineering (Linver et al., 2002; Spelke, 2005). The effect of stereotypes on mathematics performance has been well researched (Brown & Josephs, 1999; Good, Aronson, & Harder, 2008), but the degree to which stereotypes affect mathematics interest has been examined less thoroughly (Marx & Roman, 2002). Nosek et al. (2002) revealed that gender identity (i.e., seeing oneself as female) has a direct and negative effect on mathematics interest. The more gender mathematics stereotypes that girls possessed, the less likely they were to indicate an interest in mathematics. This finding held true even among women who were pursuing a mathematics or mathematics-related career. Similar studies have shown that the more girls see mathematics as a male-oriented field, the less likely they are to indicate an interest in mathematics (Boswell, 1985). Female students have attributed their lack of interest in mathematics to not wanting to be seen as "weird" or "strange," given the associations that students make that math is a field heavily dominated by men and that women "don't belong in" math-related careers (Barnet & Rivers, 2004).

Conversely, in the absence of math-related stereotypes, girls show a greater interest in mathematics and math-related careers. Women who successfully attained an engineering degree reported that they grew up in households with few gender-based stereotypes, more parental support for their career choice, and more parental involvement in their schooling (Mau, 2003). Introducing female students to strong female role models in STEM careers has been shown to increase female interest in mathematics. Doing so indicates to girls that pursuing careers in math, engineering, or other fields that require strong mathematical preparation is a viable path and encourages interest in such disciplines (Marx & Roman, 2002). In mathematics classrooms, interest in mathematics may be increased (Beier & Rittmayer, 2011) if students see their learning as socially relevant. Providing students with authentic or real-world situations and problem sets that can be examined using mathematical concepts may increase student interest and performance, particularly among girls (Bartell, 2007). These orientations influence how learners evaluate curriculum components, particularly foundational subjects such as mathematics. Academically oriented learners may value mathematics for its conceptual rigor and cognitive benefits, while vocationally oriented learners may prioritize direct operational relevance. In MET contexts, where students often have diverse career aspirations (ranging from shipboard engineering to shore-based management or postgraduate studies) work orientation is likely to shape perceptions of curriculum relevance in significant ways.

Table 1: Distribution of Mathematics applications in terms of business areas

Business area	Area of mathematical application
Manufacturing	(i) Dimensional tolerance, digital preassembly, and nominal components (ii) Modeling of manufacturing systems, reactive ion etching, and thermal processes (iii) Pattern placement and throughput in electron beam technology (iv) Process optimization (reducing time to market)
Product design	(i) Shape optimization (ii) Simulation of functionality (iii) Programming the market impacts, etc.
Materials	(i) Predicting damage and degradation of polymers (ii) Nondestructive testing (iii) Simulation of material properties
Environmental management	Modeling to guide decisions about hazardous products or processes
Information science	Bio-informatics (optimization, neural networks, Markov models, dynamical systems).

Courtesy: SIAM, (2016)

According to SIAM (2016), for the United States to remain competitive among other nations with strong traditions in mathematical sciences education, “we must attract more young Americans to careers in the mathematical sciences. These efforts are essential for the continued health of the nation's science and engineering enterprise”. The SIAM (2016) report indicates that there were many views about opportunities for new applications of mathematics. A selection of these, grouped by business area, is listed in Table 1.

The site visits, telephone surveys, and experiences of steering committee members in industry build a picture in which mathematics participates in many ways in the overall enterprise of industrial and government organizations. Davis (1994) reported that Mathematics is a key player in numerous success stories heard during site visits. Common themes are the technical advantages and cost savings that accrue from clever modeling, analysis, and computation by mathematicians working with other professionals. The mathematician's logical and problem-solving approach are widely seen to provide a noticeable competitive edge as shown in Table 2.

Table 2: Selected associations between areas of mathematics and applications encountered in site visits

Mathematical Area		Application
1	Algebra and number theory	Cryptography (understanding numbers and codes)
2	Computational fluid dynamics	Aircraft and automobile design
3	Differential equations	Aerodynamics, porous media, finance

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4	Discrete mathematics	Communication and information security
5	Formal systems and logic	Computer security, verification
6	Geometry	Computer-aided engineering and design
7	Nonlinear control	Operation of mechanical and electrical systems
8	Numerical analysis	Essentially all applications
9	Optimization	Asset allocation, shape and system design
10	Parallel algorithms	Weather modeling and prediction, crash simulation
11	Statistics	Design of experiments, analysis of large data sets
12	Stochastic processes	Signal analysis

Courtesy: Davis, (1994)

For example, CIPRA (2004) reported that in 2002, Virginia Concrete, the seventh-largest concrete company in the United States of America, began using optimization software to schedule deliveries for its drivers. The company owns 120 trucks, which had been assigned to 10 concrete plants. However, a significant constraint is that a cement truck has roughly two hours to deliver its load before it starts hardening inside the truck. Also, the construction business is very unpredictable; typically, 95 percent of a company's orders will be changed in the course of a day. According to CIPRA (2004) Virginia Concrete brought in mathematicians from George Mason University and Decisive Analytics Corporation to develop tools to automate truck dispatching. Among other changes, the mathematicians found that the company could improve delivery times significantly by moving away from the model in which individual trucks were assigned to a "home" plant. Instead, they recommended that trucks should be able to go to whichever plant is closest. Also, in overnight planning it turned out to be useful to include "phantom" trucks, representing orders that were likely to be canceled. If the order was not canceled, it could be reassigned to a real truck.

Finally, the business press has discovered the importance of mathematics, statistics, and computer science to innovation (SIAM, 2012). The software industry is making a big bet that data-driven decision making…is the wave of the future. The drive to help companies find meaningful patterns in the data that engulfs them has created a fast-growing industry in what is known as "business intelligence" or "analytics" software and services. Major technology companies-IBM, Oracle, SAP, and Microsoft-have collectively spent more than $25 billion buying up specialist companies in their respective fields.

The modern toolbox of analytic and numerical method has made mathematics a real power tool for design engineers, production engineers, architects, etc. One can bypass costly trial and error prototyping phases by resorting to symbolic analysis and numerical models. Mathematics is a natural tool to handle geometrical shapes, like the surfaces of car bodies and in the visualization techniques in Computer Aided Designs (CAD) and virtual prototyping. In fact, entertainment industry is one of the great clients for mathematical software nowadays (SIAM, 2015). Visualization and animation is the basis of computer games and the vivid special effects in movies, etc. These tricks are made possible by mathematical models. The design engineers and systems engineers have always been active users of mathematics in their profession. The possibility to set up realistic large-scale system models) and the development of modern control theory have made the computational platform a powerful tool with new dimensions.

"Business analytics" has become a new catchall phrase that includes well-established fields of applied mathematics such as operations research and management science. At the same time, however, the term also has a flavor of something new: the application of the immense databases that are becoming more and more readily available to business executives (SIAM, 2016). Mathematical approaches to logistics, warehousing, and facility location have been practiced at least since the 1950s. The new opportunity, both for businesses and for students hoping to enter industry, lies in the development of algorithms and techniques to handle large amounts of structured and unstructured data at low cost.

According to SIAM (2016), corporations are adopting business intelligence (data) and analytics (i.e., quantitative methods) across the enterprise, including such areas as marketing, human resources, finance, supply chain management, facility location, risk management, and product and process design. One cannot escape the feeling that these mathematical formulas have an independent existence and an intelligence of their own, that they are wiser than we are, wiser even than their discoverers that we get more out of them than was originally put into them. The important role that mathematics plays in our society in relationship with the many practical applications goes without saying. Regrettably, full insight into this relationship is still largely missing. The hypothesis is that with this insight, the use of mathematics becomes even more effective. It leads to a methodological approach towards design of mathematical models more than available at present as shown by Table 3.

Table 3: Distribution of mathematics graduates surveyed in five major nonacademic sectors in industry

Nonacademic sector		Ph.D.	Master's
1	Government	28%	22%
2	Engineering research, computer services, software	19%	18%
3	Electronic, computers, aerospace, transportation equipment	17%	12%
4	Services (financial, communications, transportation)	13%	22%
5	Chemical, pharmaceutical, petroleum-related	6%	2%

Courtesy: SIAM, (2016)

A study report by SIAM (2016) involving 203 mathematicians (102 masters' and 101 doctoral graduates from 1988-1992) and 75 managers who participated in the telephone surveys represented a reasonably broad spectrum of nonacademic organizations. Table 3 shows the distribution of graduates surveyed in five major sectors of industry, based on the Standard Industry Classification codes of the United States Office of Management and Budget.

According to Heilio (2004) there is an approach of presenting real industrial problems and their mathematical modeling as a motivation for developing mathematical methods that are needed for solving the problems. Graduates with hybrid orientations demonstrate the most balanced perceptions of curriculum relevance. They recognize the importance of theoretical grounding

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while also valuing applied learning experiences that bridge mathematics and professional practice. This group often advocates for curriculum designs that integrate theory and application rather than privileging one at the expense of the other.

3.0 RESEARCH METHODOLOGY

A total of 101 males and 9 females students in levels 300 and 400 of the Regional Maritime University were selected randomly to respond to the research instruments. The study which was basically quantitative, relied heavily on structured questionnaires for data collection. In order to verify the findings of the study the stated hypotheses on the perception influencers namely gender, self-efficacy and work orientations are tested at 5% alpha level using independent samples t-test analysis.

4.0 DATA ANALYSIS

4.1 The influence of gender on perception of mathematics curriculum relevance

Empirical evidence from the RMU case study, however, suggests that gender alone does not significantly differentiate perceptions of the relevance of the MET mathematics curriculum. Both male and female respondents' express similar views regarding the importance of mathematics for academic success and professional competence. This finding aligns with emerging research suggesting that gender differences in curriculum perception are increasingly mediated by psychological variables such as self-efficacy, learning experiences, and institutional support rather than gender identity per se. This does not imply that gender is irrelevant in MET education. Rather, it suggests that interventions aimed at improving curriculum relevance should focus less on gender as a demographic variable and more on addressing confidence, pedagogical inclusivity, and career alignment for all learners.

The gender of the participants is very significant in making any decisions on perceptions especially in this study though the data shows absolute majority are males. Table 4 illustrates how male and female respondents perceived the relevance of the mathematics curriculum.

Table 4: Chi-square analysis of perceptual ratings of relevance of MET Mathematics Curriculum by gender

Gender	**Relevant**	**Not relevant**	***Marginal Row Totals***	***p-value***	***χ2-calc***
Males	86 (85.39) [0]	15 (15.61) [0.02]	101	*0.5578*	*0.3436*
Females	7 (7.61) [0.05]	2 (1.39) [0.27]	9		
Marginal Column Totals	93	17	110		

The chi-square statistic is 0.3436. The p-value is .5578. Not significant at $p < .05$.

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The chi-square statistic with Yates correction is 0.011. The p-value is .916387. Not significant at $p < 0.05$.

A total of 101 males representing 91.8% and 9 females representing 8.2% responded to this item where they were requested to indicate their perception about the relevance of mathematics study in engineering programme. The Table 4 shows that of this number, a total of 17 respondents involving 2 females and 15 males said the mathematics curriculum was not relevant whereas 93 including 7 females were of the perception that mathematics curriculum was relevant. A further analysis to confirm if the mathematics curriculum is relevant to these gender groups show that the chi-square statistic is 0.3436 against the p-value of 0.5578 which is not significant at $p < 0.05$. The response indicates that both genders share the same strong perception that the mathematics curriculum being implemented is very relevant for their training.

4.2 The influence of self-efficacy on perception of mathematics curriculum relevance

Mathematics self-efficacy emerges as one of the most influential factors shaping perceptions of curriculum relevance among RMU students and graduates. Respondents with strong self-efficacy consistently describe mathematics as meaningful, useful, and integral to both academic studies and professional practice. They tend to perceive mathematics as (i) a foundational tool for understanding engineering systems, (ii) a means of developing logical reasoning and problem-solving skills; and (iii) a transferable competence applicable across maritime and non-maritime careers. Such respondents often articulate clear connections between mathematical concepts and advanced engineering courses, including thermodynamics, fluid mechanics, and marine power systems. For these learners, relevance is not limited to immediate application but extends to long-term professional growth and adaptability.

A further analysis to confirm if the mathematics curriculum is relevant according to their self-efficacy beliefs groups show that the chi-square statistic is 0.405 against the p-value of 0.687 which is not significant at $p < 0.05$. The response indicates that despite self-efficacy belief differences, the respondents share the same strong perception that the mathematics curriculum being implemented is very relevant for their training.

Table 5: Results of the independent samples t-test on the means of perceptions of relevance of MET mathematics curriculum by self-efficacy beliefs.

Independent variable	Category	N	Mean ($\bar{y}$)	S.D	t	df	Sig. (2-tailed)
Self-efficacy beliefs	Low	33	11.45	1.00	0.405	100	0.687
	Moderate	69	11.38	0.86			

To verify whether or not the participants' self-efficacy beliefs in mathematics influence their perceptions of the relevance of the MET mathematics curriculum, the descriptive statistics in Table 18 were computed and the results of the means in the relevance categories examined. The ratings on their perceptions of the relevance of the MET mathematics curriculum were subjected to further analysis by using the independent samples t-test for independent groups, to ascertain whether or not the differences observed in the means (Table 5) are significantly different. The t-test was used to test the null hypothesis that "there is no significant difference between the self-efficacy belief categories in their perception of the relevance of the MET mathematics curriculum". The results obtained for the t-test analysis is presented in Table 5 which indicates that despite self-efficacy belief differences, the respondents share the same strong perception that the mathematics curriculum being implemented is very relevant for their training.

In contrast, respondents with low mathematics self-efficacy are more likely to characterize mathematics as excessively theoretical, intimidating, and disconnected from maritime realities. They often struggle to transfer abstract concepts to applied contexts and may attribute difficulties to inherent lack of ability rather than instructional or contextual factors. These perceptions reinforce avoidance behaviors and negative attitudes, creating a cycle in which low confidence undermines perceived relevance, which in turn reduces engagement and learning outcomes. Importantly, these results suggest that perceived irrelevance is not primarily a function of curriculum content deficiencies but of learner confidence and pedagogical mediation. Strengthening mathematics self-efficacy through supportive instructional practices, formative assessment, and contextualized learning may therefore significantly enhance perceptions of relevance.

4.3 The Influence of work orientation on perceptions of mathematical relevance

To verify whether or not the participants' work orientations (i.e. engineering, or non-engineering professions) influence their perceptions of the relevance of the MET mathematics curriculum, descriptive statistics were computed and the results of the means in the relevance categories examined. The results obtained for the t-test analysis is presented in Table 6. The ratings on their perceptions of the relevance of the MET mathematics curriculum were subjected to further analysis by using the independent samples t-test for independent groups, to ascertain whether or not the differences observed in the means (Table 6) are significantly different. The t-test was used to test the null hypothesis that "there is no significant difference between those in the engineering and non-engineering-based works categories in their perceptions of the relevance of the MET mathematics curriculum.

Table 6: Results of the independent samples t-test on the means ratings of perception of the relevance of the MET mathematics curriculum by work orientations beliefs

Independent variable	Category	N	Mean (ȳ)	S.D	t	df	Sig. (2-tailed)
Work orientations	Engineering	50	11.62	0.73	1.531	57	0.131
	Non engineering	9	11.22	0.67			

It is observed that the difference in the means of participants in engineering and their counterparts in non-engineering professions was not statistically significant (t=1.531, df =57, p=0.131). Hence, the null hypothesis that "there was no significant difference between participants in engineering and their counterparts in non-engineering professions in their perception of the relevance of the MET mathematics curriculum" is accepted. It can therefore be argued that the RMU students' and graduates' perception of the relevance of the MET mathematics curriculum is neither influenced by their gender, self-efficacy beliefs in mathematics nor work orientations.

4.4 Discussion and Implications for MET Curriculum and Pedagogy

Analysis of data from RMU students and graduates reveals three overarching patterns. First, gender does not significantly differentiate perceptions of mathematics curriculum relevance, suggesting that demographic variables alone are insufficient explanations. Second, mathematics self-efficacy beliefs exert a strong influence on whether mathematics is perceived as useful, meaningful, and transferable. Third, work orientations shape expectations regarding applicability, utility, and the balance between theory and practice. The findings of this study reinforce the argument that curriculum relevance in MET mathematics is not inherent in content alone but emerges from the interaction between curriculum design, pedagogy, and learner characteristics. Even a technically sound and industry-aligned mathematics curriculum may be perceived as irrelevant if learners lack confidence or fail to see its connection to their academic and professional goals. For MET institutions, this has important implications. Curriculum reform efforts that focus exclusively on content updates or industry alignment may have limited impact if they do not address psychological and motivational dimensions of learning. Conversely, pedagogical strategies that strengthen self-efficacy and articulate utility value can enhance perceived relevance even within existing curricular structures.

5.0 FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

The findings indicate that gender differences do not significantly influence perceptions of curriculum relevance, whereas mathematics self-efficacy beliefs and work orientations play more substantial roles in shaping how mathematics is valued for academic progression and professional practice. The article argues that enhancing perceived relevance of MET mathematics requires pedagogical and curricular strategies that strengthen learner confidence, make utility value explicit, and align mathematical learning with diverse academic and occupational orientations within the maritime sector.

The findings demonstrate that while gender differences are minimal, self-efficacy beliefs and work orientations play decisive roles in shaping relevance judgments. Enhancing the perceived relevance of MET mathematics therefore requires pedagogical and curricular strategies that build learner confidence, clarify utility value, and align mathematical learning with diverse academic and professional trajectories within the maritime sector. By addressing both psychological and curricular dimensions of relevance, MET institutions can better prepare graduates for the complex and evolving demands of maritime engineering practice. Work orientation plays a critical role in shaping how students and graduates evaluate the relevance of the MET mathematics curriculum. Academically oriented respondents emphasize mathematics' contribution to: (i) conceptual understanding of engineering principles; (ii) success in advanced and specialized courses; and (iii) preparation for postgraduate education and research.

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For these learners, abstract mathematical reasoning is valued for its cognitive and epistemic benefits, even when immediate workplace application is not evident. Vocationally oriented respondents, by contrast, prioritize direct applicability to shipboard operations, equipment maintenance, and problem-solving in real-time maritime contexts. They are more likely to question the relevance of mathematical topics that are not explicitly linked to maritime technologies or operational scenarios. For this group, perceived relevance is closely tied to demonstrable utility in the workplace.

To enhance the perceived relevance of MET mathematics curricula, institutions should adopt a holistic approach that integrates curriculum, pedagogy, and learner support. Key strategies include:

i. Implementing instructional approaches that build mathematics self-efficacy through scaffolded learning, feedback, and mastery experiences.
ii. Explicitly linking mathematical concepts to maritime career roles, technologies, and regulatory requirements.
iii. Incorporating applied, industry-informed examples, simulations, and assessments.
iv. Providing academic support structures for students with weak mathematical backgrounds.
v. Recognizing and accommodating diverse work orientations through flexible and integrated curriculum design.

Such strategies can foster inclusive, motivating, and career-aligned mathematics education that supports both academic excellence and professional competence in Maritime Education and Training.

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