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Building a Champion Mindset in a Vocational School Robotics Team: The Champion Mental Approach

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ABSTRACT

Vocational schools are expected to cultivate technical competence together with confidence, persistence, teamwork, and readiness to perform under competitive pressure. This best-practice article describes the implementation of the Champion Mental Approach (CMA) in preparing the robotics team of SMK Muhammadiyah 2 Jatinom for the 2017 Central Java Olympic Ahmad Dahlan (Olympicad) robotics competition. The approach consisted of four interconnected practices: selecting students according to interest and aptitude, involving an industry robotics expert, establishing a WhatsApp communication group for mentoring and motivational support, and conducting intensive programming and troubleshooting practice. The school context included more than 1,000 students across four vocational programs. The implementation was supported by adequate workshop facilities, motivated team members, competent mentors, industry expertise, and school leadership support. Constraints included limited preparation time, incomplete competition information, and initially low confidence among team members. Following approximately two weeks of intensive preparation, the team achieved third place and qualified to represent Central Java at the next Olympicad competition in Lampung. The experience suggests that competition preparation can function as an authentic vocational-learning environment when technical practice is combined with structured mentoring, self-efficacy support, industry engagement, and reflective coaching. Because the evidence is based on a single best-practice case without standardized pre-post measures, the outcomes should be interpreted descriptively rather than causally.

Keywords: champion mindset; competition; educational robotics; vocational education; mentoring

INTRODUCTION

Vocational education is increasingly expected to prepare learners not only for occupational tasks but also for complex problem solving, collaboration, adaptability, and technology-rich work. Educational robotics offers a particularly authentic setting because learners must integrate programming, electronics, engineering design, debugging, and teamwork around a tangible system (Benitti, 2012; Alimisis, 2013; Eguchi, 2014; Anwar et al., 2019; Zhong & Xia, 2020). Recent syntheses further indicate that robotics-based STEM learning can support cognitive and affective outcomes when activities are pedagogically structured rather than treated as technology demonstrations (Xia & Zhong, 2018; Jung & Won, 2018; Evripidou et al., 2020; Ouyang & Xu, 2024; Liang et al., 2023).

Competition adds a distinctive motivational and performance context. It creates clear goals, deadlines, public performance, repeated testing, and immediate feedback, but it can also generate anxiety and social comparison. Achievement-goal research therefore distinguishes productive mastery-oriented striving from climates dominated only by outperforming others (Ames, 1992; Elliot & McGregor, 2001; Murayama & Elliot, 2012; Senko et al., 2011). In robotics competitions, the educational value is strongest when winning is accompanied by iterative learning, teamwork, technical reflection, and opportunities to recover from failure (Verner et al., 2000; Petre, 2004; Welch & Huffman, 2011; Barker & Ansorge, 2007; Menekse et al., 2017).

The source best-practice case emerged at SMK Muhammadiyah 2 Jatinom, a vocational school with more than 1,000 students and four skill programs: Audio Video Engineering, Mechanical Engineering, Light Vehicle Engineering, and Multimedia. Before 2017, the school had substantial facilities and a record of achievement in other extracurricular areas but had not participated in robotics competitions. When the Audio Video Engineering program was appointed to represent Muhammadiyah education authorities in Klaten at the 2017 Central Java Olympicad robotics competition, the school developed what the author termed the Champion Mental Approach (CMA). The guiding question was how CMA was implemented, what impacts were observed, and which supporting and inhibiting factors shaped the preparation process.

LITERATURE REVIEW

Educational Robotics, Authentic STEM Learning, and Vocational Competence

Robotics can operationalize constructionist and experiential learning by requiring students to build, program, test, diagnose, and redesign artifacts (Papert, 1980; Kolb, 1984; Sullivan, 2008; Bers et al., 2014). Studies and reviews associate educational robotics with computational thinking, engineering design, creativity, and problem-solving opportunities, although effects vary by duration, learner age, scaffolding, and assessment design (Atmatzidou & Demetriadis, 2016; Chalmers, 2018; Ioannou & Makridou, 2018; Angeli & Valanides, 2020; Çınar et al., 2021; Yang et al., 2022). In vocational settings, these features are especially relevant because competence is demonstrated through coordinated performance rather than through declarative knowledge alone. Project-based and problem-based pedagogies similarly emphasize authentic tasks, iterative production, and learner responsibility (Kokotsaki et al., 2016; Guo et al., 2020; Almulla, 2020).

Self-Efficacy, Resilience, Feedback, and Team Performance

A “champion mindset” can be interpreted more rigorously through established constructs rather than as a fixed personality trait. Self-efficacy concerns learners’ beliefs about their capability to organize and execute actions required for performance (Bandura, 1997; Schunk & DiBenedetto, 2020). Academic buoyancy and resilience concern adaptive responses to setbacks, pressure, and uncertainty (Martin &

Marsh, 2008; Yeager & Dweck, 2012; Cassidy, 2016). Growth-mindset interventions have shown heterogeneous effects, indicating that motivational messages work best when embedded in supportive contexts and concrete learning opportunities (Sisk et al., 2018; Yeager et al., 2019). Feedback is also consequential: effective feedback clarifies goals, current performance, and next actions, while feedback literacy requires learners to interpret and use information productively (Hattie & Timperley, 2007; Carless & Boud, 2018; Wisniewski et al., 2020).

Team learning additionally depends on psychological safety, coordination, and shared regulation. Teams improve when members can admit errors, ask questions, and experiment without excessive interpersonal risk (Edmondson, 1999; Newman et al., 2017). Collaborative learning research emphasizes positive interdependence, individual accountability, and structured interaction (Johnson & Johnson, 2009; Gillies, 2016). Mentoring and industry participation can strengthen vocational authenticity by exposing learners to expert reasoning, professional standards, and career-related knowledge (Kram, 1983; Crisp & Cruz, 2009; Eby et al., 2013). Digital messaging can extend such mentoring beyond scheduled face-to-face sessions when it is used for purposeful coordination rather than continuous distraction (Bouhnik & Deshen, 2014; Tang & Hew, 2017).

METHODS

Design and Case Context

This article is a structured best-practice case, not an experimental effectiveness study. The case documents preparation of the SMK Muhammadiyah 2 Jatinom robotics team for the 2017 Central Java Olympicad competition. The source narrative describes the school context, coaching sequence, observed behavioral changes, enabling conditions, constraints, and competition outcome. No standardized psychological scale, control group, pretest-posttest design, or inferential statistical analysis was reported; consequently, the evidence is presented descriptively.

Champion Mental Approach Procedure

Stage	Core activity	Intended developmental function
Selection	Open internal selection based on interest, aptitude, and willingness to compete	Identify motivated students and establish commitment
Industry mentoring	Invite a robotics practitioner with competition experience	Provide technical modeling, realistic expectations, and confidence-building
WhatsApp mentoring group	Connect students, school mentor, and industry expert	Maintain communication, monitoring, motivation, and rapid troubleshooting
Intensive practice	Daily programming, track testing, debugging, and adaptation for about two weeks	Develop technical fluency, persistence, and performance readiness

The analysis organized the source account into four categories: implementation, observed impacts, supporting factors, and inhibiting factors. Claims were retained at the level supported by the case narrative. Competition placement was treated as an outcome of the documented preparation period but not as proof that CMA alone caused the result.

RESULTS AND DISCUSSION

Implementation and Observed Outcomes

The team preparation began with internal selection in the Audio Video Engineering program. Two students were selected and then received intensive guidance. An industry robotics expert supported robot assembly and programming and shared practical knowledge from previous competitions. A WhatsApp group connected the students, school mentor, and industry expert, allowing technical questions and motivational reinforcement to continue outside direct practice sessions. During the final two weeks, the team practiced daily, conducted troubleshooting, tested programming against multiple track configurations, and adapted code after the competition track information became available.

The source account reports three salient behavioral changes: greater willingness to practice, increased confidence, and stronger enthusiasm for competition. These observations are consistent with self-efficacy theory, in which mastery experiences, social persuasion, modeling, and interpretation of performance cues can strengthen efficacy beliefs (Bandura, 1997; Schunk & DiBenedetto, 2020). They also align with research showing that authentic robotics tasks can increase engagement when learners experience agency, visible progress, and meaningful challenge (Nugent et al., 2010; Witherspoon et al., 2016; Leonard et al., 2016; Sullivan & Bers, 2019). The team ultimately achieved third place in the Central Java Olympicad

robotics competition and qualified to represent Central Java at the subsequent Olympicad event in Lampung.

Supporting and Inhibiting Factors

Dimension	Evidence reported in the case	Interpretation
Facilities	Adequate Audio Video Engineering room, materials, and programming equipment	Reduced logistical barriers to repeated practice
Team motivation	Selected members showed enthusiasm and persistence	Supported sustained deliberate practice
Competent school mentor	Mentor combined student-activity experience with programming competence	Integrated motivational and technical coaching
Industry expert	Experienced robotics practitioner provided technical and competition guidance	Added authentic expertise and professional modeling
Leadership support	School leadership provided operational funding and materials	Enabled participation and preparation
Constraints	Short two-week preparation period, incomplete competition details, initial low confidence	Increased uncertainty and compressed learning time

The case illustrates that "mental" preparation was inseparable from the learning environment. Confidence was supported through technical competence, repeated practice, expert access, social encouragement, and institutional resources rather than through motivational slogans alone. This interpretation is compatible with deliberate-practice research emphasizing focused repetition and informative feedback (Ericsson et al., 1993; Macnamara et al., 2014) and with motivation research emphasizing autonomy, competence, and relatedness (Ryan & Deci, 2020). The competitive context provided a concrete performance goal, while mentoring and iterative troubleshooting converted pressure into actionable learning tasks.

Practical Implications

For vocational schools, a sustainable robotics program should be institutionalized beyond a single competition. The source article recommends forming a permanent robotics team, organizing internal robotics competitions, and allocating development funding. These recommendations are strengthened by research suggesting that sustained, scaffolded exposure is more educationally valuable than one-off technology events (Benitti, 2012; Anwar et al., 2019; Ouyang & Xu, 2024). Schools can further improve the model by documenting individual learning goals, using structured reflection after testing failures,

rotating technical roles, and applying rubrics for programming, troubleshooting, teamwork, and communication.

Limitations

This case has important evidentiary limitations. It concerns one robotics team in one school and relies on retrospective descriptive observations. The number of selected competitors was two, preparation lasted approximately two weeks, and no validated measures of self-efficacy, resilience, motivation, or technical competence were administered. There is no comparison group, so the third-place result cannot be attributed uniquely to CMA. Future studies should operationalize CMA components, collect baseline and post-intervention measures, document practice intensity, assess technical performance with transparent rubrics, and compare cohorts across competitions or schools.

CONCLUSION AND RECOMMENDATIONS

The Champion Mental Approach at SMK Muhammadiyah 2 Jatinom combined student selection, industry mentoring, digitally supported communication, and intensive robotics programming practice. The documented case reports increased practice commitment, confidence, and competitive enthusiasm, supported by adequate facilities, motivated students, competent mentors, industry expertise, and school leadership. Major constraints were limited preparation time, incomplete competition information, and initial low confidence. The team's third-place achievement provides a meaningful practice outcome, but the descriptive design does not establish causal effectiveness. The most defensible contribution of the case is therefore a practical coaching framework that links psychological readiness to authentic technical practice. Schools seeking to adopt the approach should establish permanent robotics clubs, create internal competition pathways, strengthen industry partnerships, allocate predictable resources, and evaluate future implementations with standardized measures and longitudinal evidence.

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