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Improving 21st-Century Skills Through Market Place Activity and Mind Mapping

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ABSTRACT

This classroom action research examined the development of 21st-century skills through the combined use of Mind Mapping and Market Place Activity (MPA) within problem-based learning in the History of Islamic Civilization topic for Grade XI BDP 2 at SMK Negeri 5 Pangalengan. The participants were 32 students (5 male and 27 female). Following the Kemmis and McTaggart action-research cycle, the study comprised a pre-cycle and two intervention cycles. Data were obtained from questionnaires, observations, learning documents, peer and homeroom-teacher discussions, tests, and anecdotal notes, and were interpreted through descriptive comparison and triangulation. The mean attainment of the four targeted competencies—creative thinking, critical thinking, communication, and collaboration—increased from 55% in the pre-cycle to 70% in Cycle I and 77% in Cycle II. From the pre-cycle to Cycle II, creative thinking increased from 55% to 75%, critical thinking from 52% to 76%, communication from 56% to 78%, and collaboration from 57% to 79%. Knowledge achievement increased from a class mean of 68.44 to 82.22, while the skills assessment reached 84.60. These classroom data indicate progressive improvement across the action-research cycles. The findings support the pedagogical value of combining visual knowledge organization with structured peer exchange, while the single-class design does not establish causal effectiveness beyond the studied context.

Keywords: 21st-century skills; Market Place Activity; mind mapping; problem-based learning; classroom action research.

INTRODUCTION

Contemporary vocational education is expected to develop disciplinary knowledge together with transferable competencies that allow learners to interpret information, solve problems, generate ideas, communicate meaning, and work productively with others. The four competencies commonly summarized as the 4Cs—critical thinking, creativity, communication, and collaboration—are therefore treated as interdependent rather than isolated outcomes (Voogt & Roblin, 2012; van Laar et al., 2017; Thornhill-Miller et al., 2023; Tohani & Aulia, 2022). Research on future-oriented learning similarly emphasizes authentic participation, digital and information literacy, self-regulation, and social interaction as important dimensions of learner readiness (Binkley et al., 2012; Care et al., 2018; Shadiev & Wang, 2022; Haryani et al., 2021).

These demands are es pecially relevant in vocational schools, where students are expected to connect conceptual understanding with practical, communicative, and collaborative performance. Student-centered pedagogies can create opportunities for learners to explain ideas, negotiate meaning, make decisions, and produce visible representations of understanding (Prince, 2004; Freeman et al., 2014; Chi & Wylie, 2014; Theobald et al., 2020). Problem-based learning (PBL), when supported by appropriate scaffolding, can organize such activity around meaningful problems and collaborative inquiry (Hmelo-Silver, 2004; Savery, 2006; Yew & Goh, 2016; Dolmans et al., 2016).

In the source classroom, the History of Islamic Civilization topic was perceived as text-heavy and insufficiently engaging. The study therefore combined Mind Mapping, which externalizes conceptual relations through a visual structure, with Market Place Activity (MPA), a rotating peer-exchange strategy in which students present and collect information across groups. The combination was intended to distribute the 4Cs across complementary learning processes: Mind Mapping supported organization and idea generation, whereas MPA foregrounded explanation, questioning, communication, and collaboration. The research question was whether the classroom-action cycles using this combined strategy were accompanied by improved 21st-century skill indicators among Grade XI BDP 2 students.

LITERATURE REVIEW

21st-Century Skills and the 4Cs

Frameworks for 21st-century learning consistently identify higher-order cognition and interpersonal competence as central educational outcomes, although definitions and measurement approaches vary across contexts (Voogt & Roblin, 2012; Binkley et al., 2012; van Laar et al., 2017; Thornhill-Miller et al., 2023). Critical thinking involves purposeful analysis, evaluation, inference, and judgment, while creativity concerns generating and elaborating ideas that are both novel and appropriate (Abrami et al., 2015; Beaty et al., 2016; Runco & Jaeger, 2012; Vincent-Lancrin et al., 2019). Communication and collaboration require learners to articulate reasoning, listen and respond, coordinate roles, and build shared understanding (Johnson & Johnson, 2009; Laal & Ghodsi, 2012; Jeong & Hmelo-Silver, 2016; Gillies, 2016). Because these competencies interact during complex tasks, learning designs should create repeated opportunities to practice them in context rather than treating them only as declarative content (Care et al., 2018; Haryani et al., 2021; Shadiev & Wang, 2022).

Mind Mapping as Visual Knowledge Organization

Visual representations can reduce the burden of holding multiple relationships in working memory by externalizing structure and supporting integration across concepts (Nesbit & Adesope, 2006; Davies, 2011; Fiorella & Mayer, 2016). Mind maps and related concept-mapping approaches may support recall,

organization, elaboration, and discussion when learners actively construct rather than merely view the representation (Eppler, 2006; D'Antoni et al., 2010; Wu et al., 2012; Schroeder et al., 2018). Their pedagogical value therefore depends on the cognitive activity surrounding the map: selecting key ideas, deciding relationships, revising organization, and explaining the resulting representation to others.

Problem-Based and Collaborative Learning

PBL positions a problem as the organizing stimulus for inquiry and can foster self-directed learning, explanation, and integration of knowledge when guidance is adequate (Hmelo-Silver, 2004; Savery, 2006; Yew & Goh, 2016; Dolmans et al., 2016). Collaborative learning adds social mechanisms through which students compare perspectives, negotiate understanding, and receive peer feedback (Johnson & Johnson, 2009; Gillies, 2016; Jeong & Hmelo-Silver, 2016; Kyndt et al., 2013). Structured interaction is important because simply placing learners in groups does not guarantee productive collaboration. Role assignment, accountability, task interdependence, and opportunities to explain ideas can strengthen participation (Slavin, 2014; Webb et al., 2014; van Leeuwen & Janssen, 2019). MPA in this study operationalized these principles through presenter and visitor roles, repeated information exchange, and group rotation.

METHODS

Design and Participants

The study used classroom action research based on the Kemmis and McTaggart cycle of planning, action, observation, and reflection. The participants were 32 students in Grade XI BDP 2 at SMK Negeri 5 Pangalengan in the 2021/2022 academic year, comprising 5 male and 27 female students. The design included a pre-cycle followed by two action cycles. Because the same intact class was observed repeatedly and no comparison group was used, the analysis is interpreted as within-class descriptive change rather than as a causal estimate of treatment effectiveness.

Intervention and Data Collection

The pre-cycle used discussion and question-and-answer activities. In Cycles I and II, the teacher introduced a problem-oriented sequence combining collaborative KWL work, learning resources, PMI (Plus-Minus-Interesting) analysis, Mind Mapping, and Market Place Activity. Students were organized into four groups. Within MPA, group members took presenter or visitor roles; presenters remained at their group "store," while visitors rotated to other groups, listened to explanations, asked questions, and recorded information. Primary data consisted of student questionnaires and observations. Secondary evidence included homeroom- and peer-teacher discussions, test documents, and anecdotal notes. The source manuscript states that data were triangulated.

The study classified percentage attainment as very low (<50%), low (50–55%), adequate (56–65%), good (66–75%), and very good (>75%). The principal indicators were creative thinking, critical thinking, communication, and collaboration. Knowledge and skills achievement were also recorded through KD 3 and KD 4 assessments.

Table 1. Research interpretation criteria

Percentage	Category
<50%	Very low
50–55%	Low
56–65%	Adequate
66–75%	Good
>75%	Very good

RESULTS AND DISCUSSION

Development of the Four 21st-Century Skills

The pre-cycle profile showed creative thinking at 55%, critical thinking at 52%, communication at 56%, and collaboration at 57%. Following the first action cycle, the source comparison table reported 65%, 69%, 75%, and 71%, respectively, producing an overall mean of approximately 70%. In Cycle II, the indicators reached 75%, 76%, 78%, and 79%, with an overall mean of 77%. Thus, from pre-cycle to Cycle II, the largest increase was observed in critical thinking (+24 percentage points), followed by communication (+22), collaboration (+22), and creative thinking (+20).

Table 2. Development of 21st-century skill indicators across cycles

Dimension	Pre-cycle	Cycle I	Cycle II	Change S0–SII
Creative thinking	55%	65%	75%	+20 pp
Critical thinking	52%	69%	76%	+24 pp
Communication	56%	75%	78%	+22 pp
Collaboration	57%	71%	79%	+22 pp
Overall mean	55%	70%	77%	+22 pp

The pattern is pedagogically plausible because the intervention required students to perform the targeted competencies rather than merely hear about them. Constructing a mind map required selection, organization, connection, and representation of ideas, activities associated with generative learning and knowledge integration (Fiorella & Mayer, 2016; Davies, 2011; Schroeder et al., 2018). The MPA phase then required learners to explain their representation repeatedly, question peers, listen to alternative explanations, and coordinate group responsibilities. Such structured peer interaction can increase opportunities for elaborated explanation and socially shared knowledge construction (Gillies, 2016; Jeong & Hmelo-Silver, 2016; Webb et al., 2014; Kyndt et al., 2013).

The stronger gains in critical thinking, communication, and collaboration are also consistent with evidence that active and problem-centered learning can improve higher-order participation when tasks are sufficiently scaffolded (Abrami et al., 2015; Freeman et al., 2014; Chi & Wylie, 2014; Yew & Goh, 2016). However, classroom-action data are sensitive to observation procedures, student familiarity with instruments, teacher expectations, and changes in task difficulty. The percentages should therefore be interpreted as evidence of improvement within this instructional cycle, not as a standardized measure of the 4Cs or proof that the intervention alone caused the changes (Thornhill-Miller et al., 2023; Care et al., 2018).

Knowledge and Skills Achievement

The academic records provide a second descriptive indicator. On the first KD 3 knowledge test, 17 of 32 students met the mastery criterion and 15 had not yet achieved it; the class mean was 68.44. On the second KD 3 test, all 32 students met mastery and the mean rose to 82.22. The KD 4 skills assessment, administered in Cycle II, showed all 32 students meeting mastery with a mean of 84.60.

Table 3. Knowledge and skills achievement reported in the source manuscript

Indicator	KD 3 Test 1	KD 3 Test 2	KD 4 Test 1
Mastery achieved	17	32	32
Not yet achieved	15	0	0
Total score	2,190	2,631	2,707
Students	32	32	32
Class mean	68.44	82.22	84.60

The improvement in content achievement occurred alongside the 4C profile, suggesting that competency-oriented activity did not displace subject learning in this class. This aligns with research showing that active learning and well-designed collaborative work can support academic performance while increasing engagement (Freeman et al., 2014; Theobald et al., 2020; Kyndt et al., 2013). The instructional sequence also combined individual cognitive work with social exchange, which is important because collaboration is most effective when learners remain cognitively accountable for contributions and explanations (Slavin, 2014; Webb et al., 2014).

Practical Implications

For vocational teachers, the combined strategy offers a relatively low-technology structure for making text-dense historical material more participatory. Mind Mapping can be used to organize complex chronology, actors, ideas, and consequences, while MPA can convert the completed representation into a communication task. Teachers should provide explicit criteria for the four competencies, rotate roles so that all learners present and visit, use formative feedback during map construction, and retain individual accountability within group products. Such scaffolding is consistent with evidence that guidance and

assessment design strongly shape the quality of active and collaborative learning (Hattie & Timperley, 2007; van Leeuwen & Janssen, 2019; Panadero et al., 2017; Wisniewski et al., 2020).

The broader evidence base also supports combining problem-centered inquiry with collaborative and representational activity. Reviews and meta-analyses report positive, although context-dependent, effects for project- and problem-based approaches, especially when scaffolding, assessment, and group processes are explicitly designed (Bell, 2010; Belland et al., 2017; Chen & Yang, 2019; Dochy et al., 2003; Gijbels et al., 2005; Kokotsaki et al., 2016; Le et al., 2018; Scott, 2017). Related work emphasizes that 21st-century competence requires deliberate integration of transferable skills with disciplinary tasks rather than generic activity alone (Rotherham & Willingham, 2010; OECD, 2019), while technology-supported contextual inquiry can further strengthen engagement and critical thinking when aligned with pedagogy (Sung et al., 2015; Zumbach et al., 2004).

LIMITATIONS

The study was conducted in one intact class of 32 students and did not include a control or comparison group, random assignment, or standardized external assessment; causal claims are therefore not warranted. The source manuscript reports percentage scores from questionnaires and observations but does not provide item-level instruments, reliability coefficients, inter-rater agreement, or inferential test statistics. In addition, an internal inconsistency appears in the source presentation of Cycle I: the Cycle I chart on page 7 displays 75%, 76%, 78%, and 79%, whereas the comparison table and narrative report 65%, 69%, 75%, and 71%. The latter values were used here because they are consistent with the stated Cycle I mean of 70% and the reported pre-cycle-to-Cycle I changes. Future studies should archive the instrument, scoring rubric, raw cycle-level data, and reliability evidence and should consider a comparison design or replicated action-research classes.

CONCLUSION AND RECOMMENDATIONS

Across two classroom-action cycles, the combined use of Mind Mapping and Market Place Activity was accompanied by progressive improvement in the four observed 21st-century skill indicators among Grade XI BDP 2 students. The overall profile increased from 55% in the pre-cycle to 70% in Cycle I and 77% in Cycle II. By Cycle II, creative thinking reached 75%, critical thinking 76%, communication 78%, and collaboration 79%. Knowledge and skills achievement also improved, with the second knowledge-test mean reaching 82.22 and the skills mean 84.60. These findings support continued classroom use of visually organized, problem-oriented, and structured peer-exchange activities. Future implementation should strengthen assessment reliability, document fidelity of each learning phase, and examine the approach across multiple classes and topics before making broader effectiveness claims.

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