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The Effects of Interactive Flat Panel, Project-Based Learning, and the Semester Credit System on Students' Self-Awareness at MAN 2 Ponorogo

Pengaruh Interactive Flat Panel, Project-Based Learning, dan Sistem Kredit Semester terhadap Kesadaran Diri Siswa di MAN 2 Ponorogo

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Abstract

This study aimed to examine the effects of the *Interactive Flat Panel* (IFP), *Project-Based Learning* (PjBL), and the Semester Credit System (SCS) on strengthening students' self-awareness at MAN 2 Ponorogo. A quantitative explanatory design was employed involving 150 students selected through purposive sampling. Data were collected using a five-point Likert questionnaire and analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS. The findings revealed that IFP had a positive and significant effect on students' self-awareness ($\beta = 0.665$, $t = 3.585$, $p < 0.001$), whereas PjBL demonstrated a positive but statistically insignificant effect ($\beta = 0.331$, $p = 0.078$). The structural model exhibited very high explanatory power ($R^2 = 0.987$), indicating that integrating IFP, PjBL, and the Semester Credit System has the potential to strengthen students' self-awareness. This study contributes an interactive madrasah learning model that combines educational technology, active learning, and curriculum flexibility to foster students' character development.

Keywords: Interactive Flat Panel; Project-Based Learning; Semester Credit System; Self-Awareness

Abstrak

Penelitian ini bertujuan menganalisis pengaruh pembelajaran berbasis *Interactive Flat Panel* (IFP), *Project-Based Learning* (PjBL), dan Sistem Kredit Semester (SKS) terhadap penguatan *self-awareness* siswa di MAN 2 Ponorogo. Penelitian menggunakan pendekatan kuantitatif dengan desain eksplanatori terhadap 150 siswa yang dipilih melalui *purposive sampling*. Data dikumpulkan menggunakan angket skala Likert dan dianalisis dengan *Partial Least Squares Structural Equation Modeling* (PLS-SEM) menggunakan SmartPLS. Hasil penelitian menunjukkan bahwa pembelajaran berbasis IFP berpengaruh positif dan signifikan terhadap *self-awareness* ($\beta = 0{,}665$; $t = 3{,}585$; $p < 0{,}001$), sedangkan PjBL menunjukkan pengaruh positif tetapi belum signifikan ($\beta = 0{,}331$; $p = 0{,}078$). Model memiliki daya jelas yang sangat tinggi ($R^2 = 0{,}987$), menunjukkan bahwa integrasi IFP, PjBL, dan SKS berpotensi memperkuat kesadaran diri siswa. Penelitian ini berkontribusi dalam menawarkan model pembelajaran interaktif madrasah yang mengintegrasikan teknologi, pembelajaran aktif, dan fleksibilitas kurikulum untuk mendukung pengembangan karakter siswa.

Kata Kunci: Interactive Flat Panel; Project-Based Learning; Sistem Kredit Semester; Kesadaran Diri

INTRODUCTION

The advancement of madrasah education in the digital era demands a transformation of learning that extends beyond the adoption of technology to include the development of students' character.[1] Madrasahs are expected to provide learning experiences that are interactive, adaptive, and relevant to the demands of the twenty-first century while maintaining their fundamental role in fostering moral values, self-awareness, and Islamic principles.[2] However, in practice, the use of technology in many madrasahs remains largely limited to presentation tools for teachers, resulting in minimal changes to teacher-centered instructional practices. This condition suggests that educational innovation requires the integration of technology, instructional strategies, and academic management systems to create more meaningful learning experiences.[3]

One innovation that has recently gained attention is the use of the Interactive Flat Panel (IFP) as an interactive learning medium. Through touchscreen functionality, visual content presentation, digital quizzes, and collaborative presentations, the IFP has the potential to increase student participation and facilitate conceptual understanding, including abstract concepts in Islamic studies. Nevertheless, the effectiveness of this technology depends largely on the pedagogical strategies employed. Therefore, the implementation of the IFP should be integrated with instructional approaches that actively promote student engagement, collaboration, and reflection throughout the learning process.[4]

A relevant instructional approach that supports these objectives is Project-Based Learning (PjBL). This model positions students as active participants by engaging them in projects that address authentic problems, thereby fostering collaboration, problem-solving, time management, and self-evaluation. Within the context of Islamic education, projects can also incorporate religious values, social responsibility, and character development. In addition, the implementation of the Semester Credit System (SCS) provides students with the flexibility to manage their learning workload according to their abilities, interests, and learning pace, thereby promoting independence, responsibility, and academic decision-making skills.

These three components are closely associated with self-awareness, defined as an individual's ability to recognize emotions, strengths, limitations, goals, and personal responsibilities. From the perspective of Islamic education, self-awareness extends beyond recognizing oneself as a learner to understanding oneself as a Muslim who bears moral and spiritual responsibilities.[5]

1 Abuddin Nata, Ilmu Pendidikan Islam (Jakarta: Kencana, 2020); Ace Suryadi, Pendidikan Indonesia Menuju 2045: Isu, Strategi, dan Tata Kelola (Bandung: Remaja Rosdakarya, 2021).

2 Anugrah Mitria Sari et al., "Pemanfaatan Interactive Flat Panel (IFP)/Smartboard sebagai Media Pembelajaran Interaktif di SDN Pelambuan 4 Banjarmasin," Jurnal Pendidikan dan Pembelajaran Indonesia 6, no. 1 (2026): 170–183, https://doi.org/10.53299/jppi.v6i1.3302; Yuda Septian Kurniawan and M. Arif Rahman Hakim, "Pemanfaatan Media Pembelajaran Interactive Flat Panel Display (IFPD) dalam Pembelajaran Bahasa Inggris untuk Mahasiswa Program Studi Perbankan Syariah," Jurnal Pendidikan Tambusai 8, no. 1 (2024), https://doi.org/10.31004/jptam.v8i1.14086.

3 Bruce Joyce, Marsha Weil, and Emily Calhoun, Models of Teaching, 10th ed. (New York: Pearson, 2020); Robert E. Slavin, Educational Psychology: Theory and Practice, 13th ed. (New York: Pearson, 2021).

4 Ahmad Zainuri, "Implementasi Sistem Kredit Semester (SKS) di Madrasah Aliyah terhadap Karakter Religius pada Era Revolusi Industri 4.0," Scaffolding: Jurnal Pendidikan Islam dan Multikulturalisme 4, no. 2 (2022), https://doi.org/10.37680/scaffolding.v4i2.4822; Lutfia Nur Anisah and Istikomah, "The Implementation of the Semester Credit System Program 2 Year at the State Madrasah Aliyah," Adabiyah: Jurnal Pendidikan Islam 3 (2022), https://doi.org/10.21070/adabiyah.v3i0.1649.

5 Mita Alisah Tazkiyah and Ellen Prima, "Pengaruh Kesadaran Diri (Self-Awareness) terhadap Pengalaman Nilai-Nilai Akhlak Siswa MA Raudhatut Tholibin Kembaran," Hidayah: Cendekia Pendidikan Islam dan Hukum Syariah 3, no. 2 (2026): 133–144, https://doi.org/10.61132/hidayah.v3i2.2271; Ahmad Kosim Purnomo, Moh. Munir, and Rihab Wit Daryono, "The Role of Self-Awareness in Mediating the Influence of Islamic Boarding School Policies and Regulations on the Competency Development of Santri: PLS-SEM Approach," AL-ISHLAH: Jurnal Pendidikan 16, no. 3 (2024).

Consequently, learning experiences that provide opportunities for experience, reflection, and self-evaluation are considered more effective in fostering self-awareness than instructional approaches that focus solely on content delivery.

A persistent challenge is that the Interactive Flat Panel, Project-Based Learning, and the Semester Credit System are generally implemented independently as instructional media, teaching methods, and academic management systems, respectively. In fact, these three components have the potential to form an integrated learning ecosystem capable of simultaneously enhancing the quality of learning experiences and strengthening students' self-awareness. Previous studies have also tended to examine these components separately, leaving their integrated relationships within the context of madrasah education largely unexplored.[6]

Based on these considerations, this study aims to analyze the effects of Interactive Flat Panel-based learning, Project-Based Learning, and the Semester Credit System on strengthening students' self-awareness at MAN 2 Ponorogo. The findings are expected to contribute to the development of Islamic Education Management by proposing an interactive learning model that integrates educational technology, active learning strategies, and curriculum flexibility to foster students who are more reflective, independent, and possess strong character.

Method

This study employed a quantitative approach with an explanatory research design to analyze the effects of the Interactive Flat Panel (IFP), Project-Based Learning (PjBL), and the Semester Credit System (SCS) on students' self-awareness at MAN 2 Ponorogo.[7] The study was conducted in 2026 and involved the entire student population of MAN 2 Ponorogo. A total of 150 students were selected using purposive sampling based on the criteria that they were active students who had participated in IFP-based learning, Project-Based Learning, and the Semester Credit System.[8] Data were collected through a closed-ended questionnaire using a five-point Likert scale developed according to the indicators of each research variable.[9]

The research instrument consisted of four constructs: Interactive Flat Panel, Project-Based Learning, the Semester Credit System, and self-awareness. The content validity of the instrument was assessed by experts prior to data collection. Subsequently, the data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS software.[10] The measurement model was evaluated using outer loadings, Average Variance Extracted (AVE), composite reliability, Cronbach's alpha, and discriminant validity, whereas the structural model was assessed using path coefficients, t-statistics, p-values, R-square, effect size (f^2), predictive relevance (Q^2), and the Standardized Root Mean Square Residual (SRMR).

6 Raito Raito and Ihfad Ahmad Nauval, "Efektivitas Pembelajaran PAI dengan Menggunakan Model Pembelajaran Pelatihan Kesadaran Diri Siswa," MASAGI: Jurnal Pendidikan Agama Islam 2, no. 1 (2023): 203–210, https://doi.org/10.37968/masagi.v2i1.541.

7 John W. Creswell and J. David Creswell, Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 6th ed. (Thousand Oaks: SAGE Publications, 2023); John W. Creswell and Timothy C. Guetterman, Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research, 7th ed. (Boston: Pearson, 2024).

8 Uma Sekaran and Roger Bougie, Research Methods for Business: A Skill-Building Approach, 8th ed. (Hoboken: Wiley, 2020); Sugiyono, Metode Penelitian Kuantitatif, Kualitatif, dan R&D (Bandung: Alfabeta, 2022).

9 Syafrida Hafni Sahir, Metodologi Penelitian (Yogyakarta: KBM Indonesia, 2021); Ajat Rukajat, Pendekatan Penelitian Kuantitatif (Yogyakarta: Deepublish, 2021).

10 Joseph F. Hair, G. Tomas M. Hult, Christian M. Ringle, and Marko Sarstedt, A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM), 3rd ed. (Thousand Oaks: SAGE Publications, 2022); Joseph F. Hair, Matt C. Howard, and Christian M. Nitzl, Review of Partial Least Squares Structural Equation Modeling in Business Research (Cham: Springer, 2021).

RESULTS AND DISCUSSION

The Effect of Interactive Flat Panel-Based Learning on Strengthening Students' Self-Awareness at MAN 2 Ponorogo

Based on the data analysis conducted using SmartPLS, Interactive Flat Panel (IFP)-based learning demonstrated a positive and statistically significant effect on strengthening students' self-awareness at MAN 2 Ponorogo. This finding is indicated by a path coefficient of 0.665, a t-statistic of 3.585, and a p-value of <0.001. Since the p-value is below the 0.05 significance threshold, the relationship between IFP-based learning and students' self-awareness is considered statistically significant. Therefore, the hypothesis stating that Interactive Flat Panel-based learning positively influences students' self-awareness is supported.[11]

Table 1. Results of the Effect of Interactive Flat Panel-Based Learning

Hypothesis	Relationship	β	Mean	SD	t-value	p-value	Decision
H1	Interactive Flat Panel → Self-Awareness	0.665	0.674	0.186	3.585	<0.001	Supported

Source: Authors' analysis using SmartPLS 4 (2026).

The findings presented in Table 1 indicate that the more effectively the Interactive Flat Panel is utilized in classroom instruction, the stronger students' self-awareness becomes. In the context of MAN 2 Ponorogo, the Interactive Flat Panel functions not merely as a medium for presenting instructional content but also as a tool that promotes students' active engagement in the learning process. Through interactive displays, visual learning materials, digital quizzes, real-time annotations, and collaborative presentations, students are provided with greater opportunities to understand the subject matter, evaluate their own responses, and recognize their strengths and limitations throughout the learning process.[12]

Interactive Flat Panel-based learning also enables students to observe their learning process more concretely. Visually rich and interactive instructional materials facilitate conceptual understanding, particularly when teachers connect learning content with real-life situations and the values of Islamic education. Such learning experiences reinforce students' awareness of their learning objectives, their responsibilities as learners, and the importance of active participation in the classroom. In this way, educational technology becomes meaningful when it is employed not merely as a presentation tool but as a medium that encourages reflection and active student engagement.

From the perspective of self-awareness, the use of the Interactive Flat Panel enables students to identify learning strategies that best suit their individual needs. Students who were previously passive may become more willing to ask questions, respond to quizzes, participate in discussions, or present their work before the class. These activities encourage students to become more aware of their roles and progress within the learning process. Consequently, they are better able to recognize whether they have mastered the learning materials, whether additional clarification is needed, or whether improvements in their learning strategies are necessary. Such awareness represents an essential component of self-awareness development.

11 Hair, Hult, Ringle, and Sarstedt, A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM).

12 Sari et al., "Pemanfaatan Interactive Flat Panel (IFP)/Smartboard sebagai Media Pembelajaran Interaktif di SDN Pelambuan 4 Banjarmasin"; Kurniawan and Hakim, "Pemanfaatan Media Pembelajaran Interactive Flat Panel Display (IFPD) dalam Pembelajaran Bahasa Inggris untuk Mahasiswa Program Studi Perbankan Syariah."

The findings are further supported by the validity and reliability assessments, which indicate that the measurement model demonstrates satisfactory psychometric properties. All indicator loadings exceeded 0.70, the Average Variance Extracted (AVE) values were above 0.50, composite reliability values exceeded 0.70, and Cronbach's alpha coefficients were also greater than 0.70. These results confirm that the measurement indicators satisfy the required validity and reliability criteria, thereby providing greater confidence in interpreting the influence of the Interactive Flat Panel on students' self-awareness.

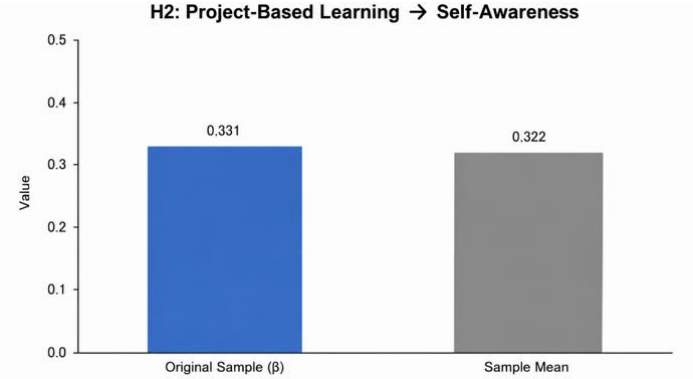
From a theoretical perspective, these findings suggest that digital learning media can contribute to the development of self-awareness when implemented within an appropriate pedagogical framework. The Interactive Flat Panel serves not merely as a visual instructional aid but as an integral component of an interactive learning ecosystem that connects instructional content, teachers, students, learning activities, and reflective practices. Students who actively participate in such interactive learning environments are more likely to perceive themselves as active learners rather than passive recipients of information. Therefore, madrasahs should ensure that the implementation of Interactive Flat Panels extends beyond their technical functions and becomes an integral part of instructional strategies designed to foster student engagement and self-awareness.

Overall, Interactive Flat Panel-based learning at MAN 2 Ponorogo can be regarded as an important factor in strengthening students' self-awareness. These findings demonstrate that technological innovation in madrasahs is more effective when directed toward enhancing student participation, reflection, and responsibility for learning. The significant relationship identified through the SmartPLS analysis indicates that interactive digital learning possesses considerable potential to support the development of students who are more aware of their abilities, learning goals, and learning behaviors.[13]

The Implementation of Project-Based Learning

This study examined the extent to which the implementation of Project-Based Learning (PjBL) contributes to strengthening students' self-awareness at MAN 2 Ponorogo. Based on the SmartPLS analysis, the relationship between Project-Based Learning and self-awareness yielded a path coefficient of 0.331, a t-statistic of 1.769, and a p-value of 0.078. Because the p-value exceeds the 0.05 significance level, the effect of Project-Based Learning on students' self-awareness is not statistically significant.

Table 2. Results of the Effect of Project-Based Learning on Students' Self-Awareness



Source: Authors' analysis using SmartPLS 4 (2026)

13 Mohammad Rohman Rifai, Widya Ariana, Muhammad Ainur Rohman, Muhammad Faza Zahiduzzaka, and Muhammad Fauzan Rivaldi, "Multicultural-Based Islamic Education Curriculum Design for Strengthening Religious and Tolerant Character," Ahlussunnah: Journal of Islamic Education 5, no. 1 (2026): 249–262, https://doi.org/10.58485/jie.v5i1.614.

Although the statistical results presented in Table 2 do not indicate a significant effect, the positive direction of the relationship suggests that Project-Based Learning has the potential to enhance students' self-awareness. The path coefficient of 0.331 indicates that improvements in the implementation of Project-Based Learning are associated with increases in students' self-awareness. However, this relationship is not sufficiently strong to reach statistical significance. This finding may indicate that Project-Based Learning has not yet been implemented consistently, lacks structured opportunities for self-reflection, or places greater emphasis on the completion of project outcomes than on students' personal development throughout the learning process.

Within the learning context of MAN 2 Ponorogo, Project-Based Learning should provide opportunities for students to recognize their own abilities through authentic learning experiences. While completing projects, students are expected not only to understand academic content but also to manage their time, distribute responsibilities, collaborate with peers, solve problems, and evaluate their individual contributions. These experiences are closely related to self-awareness because they enable students to recognize their strengths, weaknesses, emotions, responsibilities, and patterns of interaction with others. However, when project activities are treated merely as routine group assignments, their contribution to students' self-awareness is likely to remain limited.[14]

The absence of a statistically significant effect may also indicate that the implementation of Project-Based Learning requires greater emphasis on reflective learning. Reflection constitutes an essential stage of Project-Based Learning because it encourages students to examine and internalize their learning experiences.[15] Without systematic reflection, students may focus primarily on completing project outputs, such as reports, posters, presentations, or other products, without fully recognizing how the learning process contributes to their personal development. Therefore, teachers should incorporate reflective writing, evaluative discussions, learning journals, and individualized feedback into every project to maximize its contribution to students' self-awareness.[16]

Project-Based Learning also requires project designs that are closely connected to students' everyday experiences. Projects that are excessively formal, highly technical, or disconnected from students' real-life contexts may cause learning activities to be perceived merely as administrative tasks. In contrast, projects addressing social issues, Islamic values, environmental concerns within the madrasah, digital literacy, discipline, social responsibility, and ethical behavior are more likely to help students connect their learning experiences with personal development. Within the context of madrasah education, projects should therefore produce not only academic outcomes but also foster Islamic values such as trustworthiness (*amanah*), honesty, cooperation, social responsibility, and proper conduct (*adab*).[17]

The R-square value of 0.987 for the self-awareness construct indicates that the structural model possesses very strong explanatory power. This suggests that the variables included in the model collectively explain a substantial proportion of the variance in students' self-awareness.

14 Joyce, Weil, and Calhoun, Models of Teaching; Slavin, Educational Psychology: Theory and Practice.

15 Hattie, Visible Learning: The Sequel (London: Routledge, 2023).

16 Fatma Azzahra, M. Faza Zahiduzaka, Mohammad Rohman Rifai, and Ahmad Sulthon, "Schools of Thought in Islamic Philosophy of Education and Their Implications for Contemporary Education," TOFEDU: The Future of Education Journal 5, no. 2 (2026): 3324–3335, https://doi.org/10.61445/tofedu.v5i2.2075.

17 Muhammad Faza Zahiduzzaka, Mohammad Rohman Rifai, M. Fauzan Rivaldi, Mambaul Ngadhimah, and Nur Rahmi Sonia, "Konsep Pendidikan Agama Islam Madrasah Diniyyah: Urgensi dan Tujuannya Menurut Salsalah Rafid Littahyil As-Saqofi," ILJ: Islamic Learning Journal 4, no. 2 (2026): 358–375, https://doi.org/10.54437/iljjislamiclearningjournal.v4i2.3115.

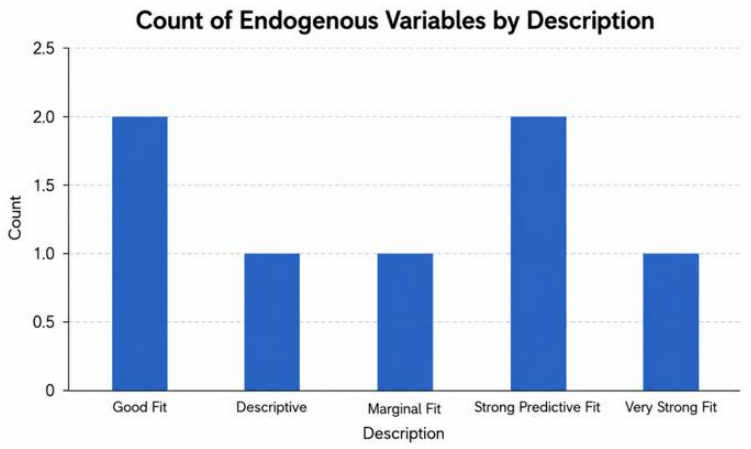
Nevertheless, at the individual level, the contribution of Project-Based Learning remains limited and requires further enhancement. These findings imply that Project-Based Learning should not merely function as an instructional method but should be intentionally designed as a meaningful process of personal development. Teachers are therefore encouraged to develop projects with clearly defined stages, measurable reflection indicators, equitable role distribution, and comprehensive evaluations of both learning processes and outcomes.

Overall, the implementation of Project-Based Learning at MAN 2 Ponorogo demonstrates a positive association with students' self-awareness, although the relationship has not yet reached statistical significance. These findings suggest that madrasahs should strengthen the implementation of Project-Based Learning by improving the intensity of its application, the quality of teacher guidance, the depth of reflective activities, and the alignment of projects with students' personal experiences. Strengthening these aspects would enable Project-Based Learning to become a more effective instructional strategy for developing students who are capable not only of producing meaningful work but also of understanding themselves throughout the learning process.

The Effect of the Semester Credit System on Strengthening Students' Self-Awareness at MAN 2 Ponorogo

In this study, the Semester Credit System (SCS) is conceptualized as a learning management system that enables students to undertake academic workloads according to their abilities, interests, talents, and learning pace. Within the interactive madrasah learning ecosystem, the Semester Credit System occupies an important position because it is closely associated with students' independence, academic responsibility, decision-making, and their ability to understand their own capacities. Based on the SmartPLS output, the R-square value for the self-awareness construct was 0.987, indicating that the overall model possesses very strong explanatory power in accounting for variations in students' self-awareness.[18]

Table 3. R-Square Value for Students' Self-Awareness



Source: Authors' analysis using SmartPLS 4 (2026)

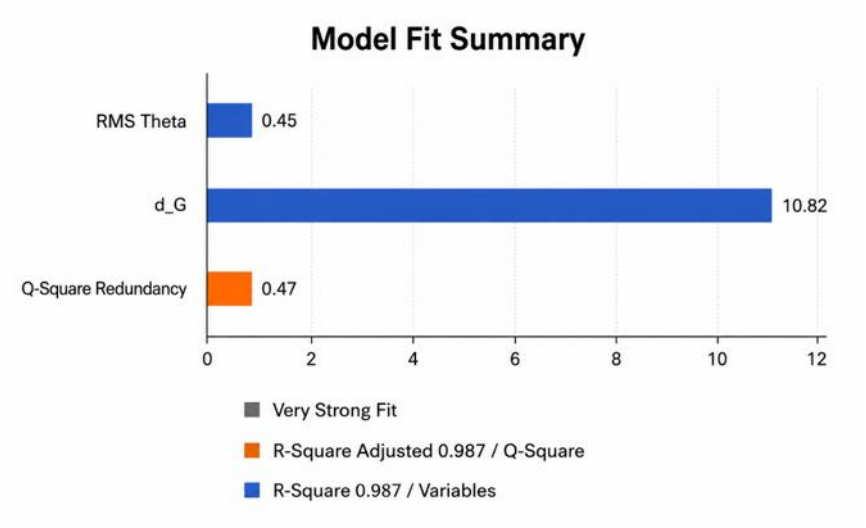
An R-square value of 0.987 indicates that 98.7% of the variance in students' self-awareness can be explained by the constructs included in the research model. As shown in Table 3, the proposed model demonstrates substantial explanatory power. Within the context of MAN 2

18 Zainuri, "Implementasi Sistem Kredit Semester (SKS) di Madrasah Aliyah terhadap Karakter Religius pada Era Revolusi Industri 4.0"; Anisah and Istikomah, "The Implementation of the Semester Credit System Program 2 Year at the State Madrasah Aliyah."

Ponorogo, the Semester Credit System may represent an important component in strengthening students' self-awareness because it encourages them to become more conscious of their academic choices, learning readiness, time management, and responsibility for achieving learning outcomes.

In addition to the R-square value, the predictive relevance analysis also indicates that the model possesses satisfactory predictive capability. The Q-square redundancy value for self-awareness was 0.758, while the Q-square communality value reached 0.706. Since both values exceed zero, the model demonstrates adequate predictive relevance. In other words, the SmartPLS model not only explains the relationships among the variables but also predicts students' self-awareness effectively.

Table 4. Predictive Relevance of Students' Self-Awareness



Source: Authors' analysis using SmartPLS 4 (2026)

The Semester Credit System can strengthen students' self-awareness because it requires them to actively understand their own abilities before engaging in the learning process (see Table 4). Students must recognize their academic capabilities, readiness to undertake learning workloads, ability to complete assignments, and the consequences of the academic choices they make. Consequently, the Semester Credit System functions not only as an administrative curriculum system but also as a mechanism for fostering personal responsibility. Through its implementation, students learn that academic success depends not only on teachers but also on their own awareness in planning, implementing, and evaluating their learning process.[19]

In practice at MAN 2 Ponorogo, the influence of the Semester Credit System on students' self-awareness becomes stronger when supported by consistent academic advising. Academic advisors play an essential role in helping students understand their academic options, monitor their progress, and provide guidance whenever learning difficulties arise. Without such support, the Semester Credit System may become merely an administrative mechanism that offers academic flexibility without promoting students' self-awareness.

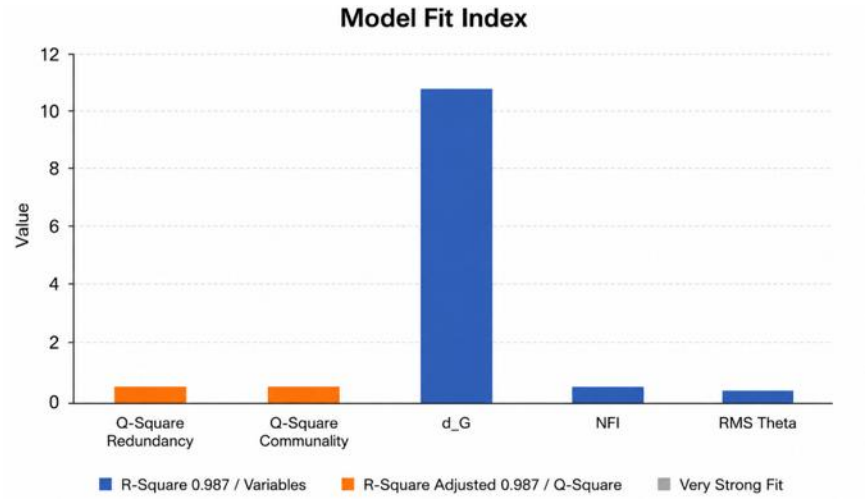
The Semester Credit System also contributes to the development of self-awareness through continuous monitoring of students' academic achievement. By understanding their academic progress, students are able to evaluate their abilities more objectively. They become more aware of the subjects requiring improvement, learning habits that should be modified, and strategies

19 Zainuri, "Implementasi Sistem Kredit Semester (SKS) di Madrasah Aliyah terhadap Karakter Religius pada Era Revolusi Industri 4.0."

that need to be adopted to enhance their academic performance. Such self-evaluation constitutes a fundamental dimension of self-awareness. Therefore, the Semester Credit System plays an important role in cultivating students' reflective learning habits.

Based on the model fit assessment, the SRMR value of 0.059 indicates that the model achieved a good fit because it falls below the recommended threshold of 0.06. The d_ULS value of 2.077 and the d_G value of 10.785 also suggest acceptable model fit. Meanwhile, the NFI value of 0.570 indicates that the model adequately represents the relationships observed in the data. Although the RMS Theta value of 0.272 falls within the marginal fit category, the overall model remains appropriate for explaining the relationships among the variables investigated in this study.[20]

Table 5. Summary of the SmartPLS Model Fit



Source: Authors' analysis using SmartPLS 4 (2026)

Overall, Table 5 demonstrates that the Semester Credit System can be regarded as an important component of the interactive madrasah learning ecosystem that supports the strengthening of students' self-awareness. The system provides students with opportunities to recognize their abilities, manage their learning choices, take responsibility for their academic achievement, and continuously evaluate their learning progress. Nevertheless, the effectiveness of the Semester Credit System largely depends on the quality of academic advising, the availability of transparent academic information, continuous learning monitoring, and a madrasah culture that encourages independent learning.[21] Therefore, MAN 2 Ponorogo should ensure that the implementation of the Semester Credit System is directed not only toward curriculum flexibility but also toward developing students who are self-aware, independent, and responsible throughout the learning process.[22]

Based on the SmartPLS algorithm results, the structural model indicates that the Interactive Flat Panel (IFP), Project-Based Learning (PjBL), and the Semester Credit System (SCS) were specified as exogenous constructs influencing students' self-awareness (SA), which served as the

20 Hair, Hult, Ringle, and Sarstedt, A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM); Hair, Howard, and Nitzl, Review of Partial Least Squares Structural Equation Modeling in Business Research.

21 Tazkiyah and Prima, "Pengaruh Kesadaran Diri (Self-Awareness) terhadap Pengalaman Nilai-Nilai Akhlak Siswa MA Raudhatut Tholibin Kembaran"; Purnomo, Munir, and Daryono, "The Role of Self-Awareness in Mediating the Influence of Islamic Boarding School Policies and Regulations on the Competency Development of Santri."

22 Krisnanda Alifia Ramadhanty, Moh. Miftachul Choiri, Lailatun Ni'mah, Mohammad Rohman Rifai, Muhammad Faza Zahiduzzaka, and Mambaul Ngadimah, "Maqasid Syariah as the Foundation of Religious Moderation in a Multicultural Society: A Conceptual Analysis of Strengthening Social Benefits," Edusoshum: Journal of Islamic Education and Social Humanities 6, no. 3 (2026): 1717–1727, https://doi.org/10.52366/edusoshum.v6i3.465.

endogenous construct at MAN 2 Ponorogo. The loading factors of all indicators exceeded the recommended threshold of 0.70, indicating that the indicators of IFP, PjBL, SCS, and SA were valid measures of their respective constructs. The path coefficient from IFP to self-awareness was 0.665, indicating a strong positive effect, whereas the path coefficient from PjBL to self-awareness was 0.331, indicating a positive but comparatively weaker effect. Meanwhile, the path from the Semester Credit System to self-awareness was retained in the structural model for further evaluation through the bootstrapping procedure. Furthermore, the R^2 value of 0.987 for the self-awareness construct indicates that variations in students' self-awareness are explained to a very large extent by the combined effects of IFP-based learning, Project-Based Learning, and the Semester Credit System.[23]

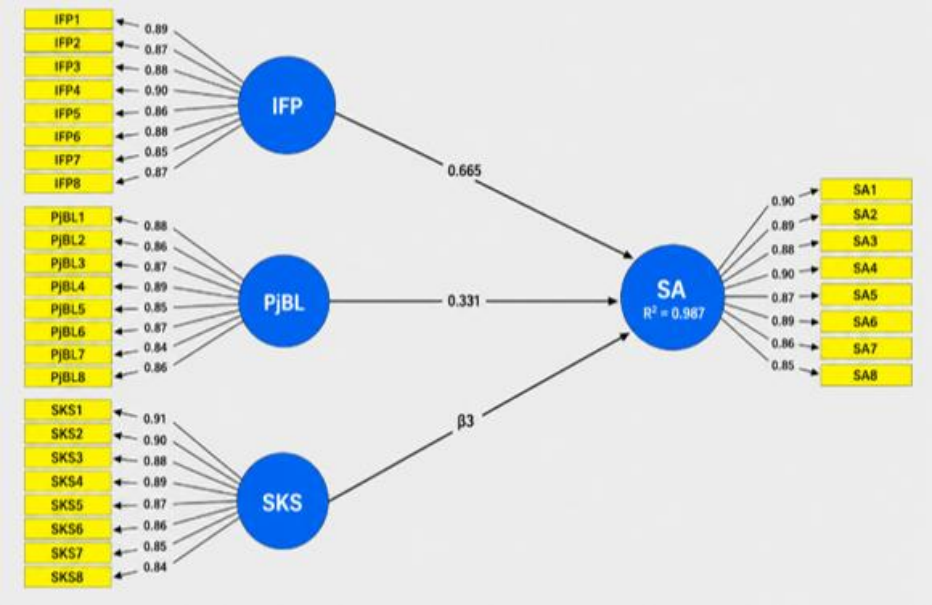


Figure 1. SmartPLS Algorithm Results

Source: Authors' analysis using SmartPLS 4 (2026)

Overall, the algorithm results presented in Figure 1 indicate that the proposed interactive madrasah learning ecosystem demonstrates satisfactory measurement quality and, from a conceptual perspective, provides an appropriate framework for explaining the strengthening of students' self-awareness. Nevertheless, the final conclusion regarding the significance of the structural relationships should be based on the bootstrapping results rather than solely on the algorithm output.

Based on the overall findings, Interactive Flat Panel-based learning demonstrated a positive and statistically significant effect on strengthening students' self-awareness at MAN 2 Ponorogo. These findings indicate that interactive educational technology can effectively promote student engagement and reflective learning when implemented appropriately. In contrast, Project-Based Learning showed a positive relationship with students' self-awareness, although the effect did not reach statistical significance. This finding suggests the need to strengthen reflective activities, teacher guidance, and the relevance of project tasks to students' personal experiences.[24]

23 Hair, Hult, Ringle, and Sarstedt, A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM).

24 Muhammad Ainur Rohman, M. Miftahul Ulum, Zennanta Agustia, Muhammad Fauzan Rivaldi, Mohammad Rohman Rifai, Muhammad Faza Zahiduzzaka, Muchtar Arofat, and Ziad Ahmad Zarkasyi, "Islamic Tolerance as an Ethics of Coexistence in Muḥammad ʿImārah's Thought," Edusoshum: Journal of Islamic Education and Social Humanities 6, no. 2 (2026): 1123–1137, https://doi.org/10.52366/edusoshum.v6i2.397.

The Semester Credit System provides both conceptual and structural contributions to strengthening students' self-awareness by encouraging learners to recognize their abilities, make informed academic decisions, and evaluate their learning outcomes. The R-square and Q-square values further demonstrate that the proposed model possesses strong explanatory and predictive capabilities regarding students' self-awareness. Therefore, an interactive madrasah learning ecosystem integrating the Interactive Flat Panel, Project-Based Learning, and the Semester Credit System represents a relevant instructional model for strengthening students' self-awareness, provided that its implementation extends beyond the use of technological tools, project assignments, and curriculum regulations to genuinely foster reflective, independent, and responsible learners with strong character.

CONCLUSION

Based on the findings of this study, it can be concluded that an interactive madrasah learning ecosystem integrating the Interactive Flat Panel (IFP), Project-Based Learning (PjBL), and the Semester Credit System (SCS) plays an important role in strengthening students' self-awareness at MAN 2 Ponorogo. Interactive Flat Panel-based learning demonstrated a positive and statistically significant effect on students' self-awareness, with a path coefficient of 0.665 and a p-value of <0.001, indicating that interactive technology can effectively enhance self-awareness when utilized to promote participation, visualization, feedback, and reflective learning. Project-Based Learning also exhibited a positive relationship with students' self-awareness, with a path coefficient of 0.331, although the effect was not statistically significant ($p = 0.078$). This finding suggests that while Project-Based Learning has the potential to foster self-awareness, its implementation should be strengthened through more structured reflection, effective teacher guidance, and greater alignment between project activities and students' lived experiences. Furthermore, the Semester Credit System contributes to strengthening students' self-awareness by encouraging them to recognize their abilities, manage their learning workload, make informed academic decisions, and evaluate their own learning progress. The R-square value of 0.987 indicates that the proposed model possesses substantial explanatory power in explaining variations in students' self-awareness.

Based on these findings, MAN 2 Ponorogo is encouraged to develop a more systematic approach to interactive learning by positioning the Interactive Flat Panel not merely as a presentation tool but as a medium for dialogue, collaboration, assessment, and student reflection. Teachers should receive continuous professional development to design technology-enhanced learning experiences that are not only visually engaging but also pedagogically meaningful and supportive of character development. The implementation of Project-Based Learning should be strengthened through more contextual project design, clearly defined roles, process-oriented assessment, reflective journals, and individualized feedback to ensure that students develop both academic products and personal growth throughout the learning process. Likewise, the Semester Credit System should be supported by consistent academic advising to ensure that learning flexibility effectively promotes students' responsibility, discipline, and independent learning. Future research is recommended to validate the proposed model using broader empirical data, classroom observations, interviews with teachers and students, and comparative studies across different classes or madrasahs to provide more comprehensive and applicable findings.

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