PENINGKATAN KEMAMPUAN *STATISTICAL LITERACY* DAN PERUBAHAN *SELF-REGULATED LEARNING* SISWA SMP DENGAN *PROJECT-BASED LEARNING*

TESIS

diajukan untuk memenuhi sebagian syarat untuk memperoleh gelar
Magister Pendidikan Program Studi Pendidikan Matematika

Oleh

Febrinna Marchy

NIM 2208171

PROGRAM STUDI PENDIDIKAN MATEMATIKA

FAKULTAS PENDIDIKAN MATEMATIKA DAN ILMU PENGETAHUAN ALAM

UNIVERSITAS PENDIDIKAN INDONESIA

2024

LEMBAR HAK CIPTA

PENINGKATAN KEMAMPUAN *STATISTICAL LITERACY* DAN PERUBAHAN *SELF-REGULATED LEARNING* SISWA SMP DENGAN *PROJECT-BASED LEARNING*

Oleh

Febrinna Marchy

S.Pd. Universitas Riau, 2020

Sebuah tesis yang diajukan untuk memenuhi salah satu syarat memperoleh gelar Magister Pendidikan (M.Pd) pada Program Studi Pendidikan Matematika

© Febrinna Marchy 2024

Universitas Pendidikan Indonesia

Agustus 2024

Hak Cipta dilindungi undang-undang

Tesis ini tidak boleh diperbanyak seluruhnya atau sebagian, dengan dicetak ulang, difotokopi, atau cara lainnya tanpa izin dari penulis.

LEMBAR PENGESAHAN TESIS

FEBRINNA MARCHY
NIM. 2208171

PENINGKATAN KEMAMPUAN *STATISTICAL LITERACY* DAN PERUBAHAN *SELF-REGULATED LEARNING* SISWA SMP DENGAN *PROJECT BASED LEARNING*

Disetujui dan disahkan oleh:
Pembimbing I,

Dr. Bambang Avip Priatna, M.Si.
NIP. 196101121987031003

Pembimbing II,

Dr. Elah Nurlaelah, M.Si.
NIP. 196411231991032002

Mengetahui,
Ketua Program Studi Magister Pendidikan Matematika

Prof. Al Jupri, S.Pd., M.Sc., Ph.D.
NIP. 198205102005011002

LEMBAR PERNYATAAN

Dengan ini saya menyatakan bahwa tesis dengan judul:

PENINGKATAN KEMAMPUAN *STATISTICAL LITERACY* DAN PERUBAHAN *SELF-REGULATED LEARNING* SISWA SMP DENGAN *PROJECT-BASED LEARNING*

Beserta seluruh isinya adalah benar-benar karya saya dan bukan hasil penjiplakan atau plagiasi dengan cara yang tidak sesuai dengan etika ilmu yang berlaku dalam masyarakat keilmuan.

Atas pernyataan yang saya buat, saya siap menanggung segala resiko atau sanksi jika di kemudian hari ditemukan adanya pelanggaran terhadap etika keilmuan atau adanya klaim dari pihak lain terhadap keaslian karya saya.

Demikian surat pernyataan ini dibuat dengan sebenar-benarnya.

Bandung, Agustus 2024

Yang membuat pernyataan

Febrinna Marchy
NIM. 2208171

ABSTRAK

Febrinna Marchy. (2208171). Peningkatan Kemampuan *Statistical Literacy* dan Perubahan *Self-Regulated Learning* Siswa SMP dengan *Project-Based learning.*

Statistical Literacy (SL) merupakan kemampuan penting bagi siswa di abad ke-21. Ada seruan untuk meningkatkan SL dalam kurikulum matematika karena pentingnya dalam kehidupan sehari-hari. Selain itu, guru juga perlu memperhatikan kompetensi sikap siswa, khususnya *Self-Regulated Learning* (SRL). Penelitian ini bertujuan untuk memperoleh gambaran serta menganalisis peningkatan kemampuan SL dan perubahan SRL yang memperoleh *Project-Based Learning* (PjBL) dan pembelajaran konvensional. Penelitian ini menggunakan metode kuantitatif dengan desain penelitian *quasi experiment.* Populasi dari penelitian ini adalah siswa kelas VIII di salah satu SMP Negeri di Kota Bandung tahun ajaran 2023/2024. Sampel yang diambil sebanyak 68 orang siswa kelas VIII yang terdiri dari 2 kelas. Instrumen yang digunakan dalam penelitian ini diantaranya soal tes SL dan angket SRL yang telah diuji validitas dan reliabilitasnya. Penelitian ini memperoleh temuan diantaranya: (1) Peningkatan kemampuan SL siswa yang memperoleh *project-based learning* lebih tinggi secara signifikan daripada siswa yang memperoleh pembelajaran konvensional; (2) Terdapat perbedaan peningkatan kemampuan SL yang signifikan antara siswa yang memiliki Kemampuan Matematika Awal (KMA) tinggi, sedang, dan rendah. Berdasarkan uji *post hoc* peningkatan kemampuan SL paling signifikan terjadi pada siswa dengan KMA tinggi dibandingkan dengan dua kelompok lainnya; (3) Peningkatan kemampuan SL antara siswa kelas PjBL dan kelas konvensional bervariasi untuk tiap kategori KMA siswa, tidak terdapat perbedaan yang signifikan untuk kategori KMA tinggi dan rendah, tetapi untuk kategori KMA sedang, kelas PjBL lebih efektif dibandingkan kelas konvensional. (4) Perubahan SRL siswa yang memperoleh PjBL lebih baik secara signifikan daripada siswa yang memperoleh pembelajaran konvensional; (5) Tidak terdapat perbedaan perubahan SRL siswa yang signifikan antara siswa yang memiliki KMA tinggi, sedang, dan rendah; (6) Perubahan SRL antara siswa kelas PjBL dan kelas konvensional berbeda untuk tiap kategori KMA siswa, untuk kategori KMA tinggi dan sedang, tidak terdapat perbedaan yang signifikan, namun untuk kategori KMA rendah, kelas PjBL menunjukkan perubahan SRL yang lebih signifikan dibandingkan kelas konvensional; (7) Terdapat korelasi positif sebesar 0,275 antara peningkatan kemampuan SL dan perubahan SRL, dengan koefisien determinasi 8%.

Kata Kunci: *Statistical Literacy, Self- Regulated Learning, Project-Based Learning*

ABSTRACT

Febrinna Marchy. (2208171). Improving Statistical Literacy Abilities and Changes in Self-Regulated Learning of Junior High School Students with Project-Based Learning.

Statistical Literacy (SL) is an essential ability for students in the 21st century. There are calls to enhance SL in the mathematics curriculum due to its importance in daily life. Additionally, teachers need to pay attention to students' attitudinal competencies, particularly Self-Regulated Learning (SRL). This study aims to obtain an overview and analyze the improvement of SL abilities and changes in SRL that receive Project-Based Learning (PjBL) and conventional learning. This study uses a quantitative method with a quasi-experimental research design. The population of this study were grade VIII students at one of the State Junior High Schools in Bandung City in the 2023/2024 academic year. The sample taken was 68 grade VIII students consisting of 2 classes. The instruments used in this study included SL test questions and SRL questionnaires that had been tested for validity and reliability. This study obtained findings including: (1) The increase in SL abilities of students who received project-based learning was significantly higher than students who received conventional learning; (2) There is a significant difference in the increase in SL abilities between students who have high, medium, and low Initial Mathematics Ability (IMA). Based on the post hoc test, the most significant increase in SL abilities occurred in students with high IMA compared to the other two groups; (3) The increase in SL ability between students in PjBL class and conventional class varies for each category of student IMA, there is no significant difference for the high and low IMA categories, but for the medium IMA category, PjBL class is more effective than conventional class. (4) The change in SRL of students who receive PjBL is significantly better than students who receive conventional learning; (5) There is no significant difference in change in SRL of students between students with high, medium, and low IMA; (6) The change in SRL between students in PjBL class and conventional class is different for each category of student IMA, for the high and medium IMA categories, there is no significant difference, but for the low IMA category, PjBL class shows a more significant change in SRL than conventional class; (7) There is a positive correlation of 0.275 between the increase in SL ability and the change in SRL, with a determination coefficient of 8%.

Keywords: *Statistical Literacy, Self-Regulated Learning, Project-Based Learning*

KATA PRAKATA

Puji syukur kehadirat Allah SWT karena atas rahmat dan lindungan-Nya penulis mampu menyelesaikan penulisan tesis yang berjudul "**Peningkatan Kemampuan *Statistical Literacy* dan Perubahan *Self-Regulated Learning* Siswa SMP dengan *Project-Based learning***" dengan baik. Penulisan tesis ini didasari atas pemikiran bahwa saat ini kita hidup di era data terbuka, Statistik disebarkan secara luas di media, kemampuan SL menjadi sangat penting dan perlu dipelajari oleh semua orang seperti halnya memahami data, menafsirkan dan mengevaluasi secara kritis berbagai informasi statistik serta bekerja dengan berbagai bentuk data. Kemampuan ini memungkinkan siswa untuk mengembangkan kemampuan *statistical literacy* dan mempersiapkan mereka untuk sukses dalam dunia kerja yang semakin tergantung pada teknologi dan informasi statistik. Selain itu, guru juga perlu memperhatikan kompetensi sikap siswa, khususnya *Self-Regulated Learning* (SRL)

Tesis ini mengkaji perolehan gambaran serta menganalisis peningkatan kemampuan SL dan perubahan SRL yang memperoleh pembelajaran dengan *project-based learning* dan pembelajaran konvensional, serta menganalisis peningkatan kemampuan SL dan perubahan SRL siswa berdasarkan KMA dengan *project-based learning* dan pembelajaran konvensional.

Penulis berharap tesis ini dapat memberikan informasi yang bermanfaat bagi para pembaca yang tertarik untuk mengembangkan kemampuan *statistical literacy* dan *self-regulated learning* siswa melalui *Project-based learning*.

Bandung, Agustus 2024

Febrinna Marchy
NIM. 2208171

UCAPAN TERIMA KASIH

Penulis ingin mengungkapkan rasa syukur dan terima kasih yang mendalam kepada Allah SWT, sumber segala kebijaksanaan dan kemurahan-Nya, yang telah memberikan petunjuk dan kekuatan dalam menyelesaikan perjalanan penyusunan tesis ini. Tesis ini adalah buah kerjasama dan dukungan dari berbagai pihak yang tak terhitung, dan penulis ingin menyampaikan apresiasi yang tulus kepada mereka. Oleh karena itu, dengan penuh kerendahan hati, penulis ingin menyampaikan ucapan terima kasih kepada:

1. Bapak Dr. Bambang Avip Priatna Martadiputra, M.Si., dan Ibu Dr. Elah Nurlaelah, M.Si. selaku pembimbing I dan II, yang telah memberikan bimbingan, motivasi, dan arahan yang tak henti-hentinya selama penelitian ini.
2. Ketua Prodi Magister Pendidikan Matematika, Prof. Al Jupri, S.Pd., M.Sc., Ph.D., terima kasih atas dukungan dan bantuan yang diberikan dalam proses penulisan tesis.
3. Dekan FPMIPA UPI, Bapak Prof. Dr. Tatang Herman, M.Ed., terima kasih atas segala bantuan yang telah diberikan demi kelancaran penulisan tesis ini.
4. Seluruh dosen dan staf tata usaha di Prodi FPMIPA dan sekolah pascasarjana Universitas Pendidikan Indonesia yang telah memberikan kontribusi positif.
5. Kepala SMP Negeri 5 Bandung, Guru, dan Staf, yang memberikan penulis kesempatan dan kerjasama yang diberikan dalam pelaksanaan penelitian di sekolah.
6. Kedua orang tua, yang senantiasa memberikan dorongan baik moril maupun materil kepada penulis.
7. Sahabat dan teman-teman dekat yang senantiasa menjadi penyemangat selama perjalanan penulisan tesis.
8. Siswa-Siswi Kelas VIII SMP Negeri 5 Bandung yang telah berkontribusi dan partisipasi dalam penelitian, semoga hasilnya bermanfaat bagi perkembangan pendidikan.
9. Semua Pihak yang turut membantu, namun tidak dapat disebutkan satu per satu, terima kasih atas segala bantuan dalam penyusunan tesis ini.

Semoga Allah SWT senantiasa melimpahkan rahmat dan karunia-Nya kepada semua pihak yang telah membantu dalam perjalanan penyusunan tesis ini. Amin.

Bandung, Agustus 2024

Febrinna Marchy

NIM. 2208171

DAFTAR ISI

HALAMAN JUDUL
LEMBAR HAK CIPTA ii
LEMBAR PENGESAHAN iii
LEMBAR PERNYATAAN iv
ABSTRAK v
ABSTRACT vi
KATA PRAKATA vii
UCAPAN TERIMA KASIH viii
DAFTAR ISI x
DAFTAR TABEL xiv
DAFTAR GAMBAR xvi
DAFTAR LAMPIRAN xvii

BAB I PENDAHULUAN 1
1.1 Latar Belakang Penelitian 1
1.2 Rumusan Masalah Penelitian 12
1.3 Tujuan Penelitian 13
1.4 Manfaat Penelitian 14
1.5 Batasan Masalah 15
1.6 Definisi Operasional 15
BAB II KAJIAN TEORITIS 18
2.1 Kajian Teori 18
2.1.1 *Statistical Literacy* 18
2.1.2 *Self-Regulated Learning* 24
2.1.3 *Project-based Leaning* 33
2.1.4 Pendekatan Saintifik 43
2.2 Penelitian yang Relevan 52
2.3 Kerangka Berpikir 55
2.4 Hipotesis Penelitian 61

BAB III METODE PENELITIAN 62
3.1 Desain Penelitian 62
3.2 Populasi dan Sampel Penelitian 63
3.3 Tempat dan Waktu Penelitian 64
3.4 Variabel Penelitian 64
3.5 Teknis Pengumpulan Data 65
3.6 Instrumen Penelitian 66
3.7 Prosedur Penelitian 71
3.8 Teknik Analisis Data 73
BAB IV HASIL PENELITIAN DAN PEMBAHASAN 82
4.1 Hasil Penelitian 82
4.1.1 Data Deskriptif Peningkatan Kemampuan *Statistical Literacy* Siswa 83
4.1.2 Data Deskriptif Perubahan *Self-Regulated Learning* Siswa 86
4.1.3 Analisis Peningkatan Kemampuan *Statistical Literacy* Siswa 88
4.1.4 Analisis Perbedaan Peningkatan Kemampuan *Statistical Literacy* antara Siswa yang Memiliki Kemampuan Matematika Awal (KMA) Tinggi, Sedang, dan Rendah 89
4.1.5 Analisis Perbedaan Peningkatan Kemampuan *Statistical Literacy* antara Siswa Kelas *Project-based Learning* dan Kelas Konvensional untuk Kategori KMA: a) Tinggi; b) Sedang; dan c) Rendah 92
4.1.6 Analisis Perubahan *Self-Regulated Learning* Siswa 97
4.1.7 Analisis Perbedaan Perubahan *Self-Regulated Learning* antara Siswa yang Memiliki Kemampuan Matematika Awal (KMA) Tinggi, Sedang, dan Rendah 99

4.1.8 Analisis Perbedaan Perubahan *Self-Regulated Learning* antara Siswa Kelas *Project-based Learning* dan Kelas Konvensional untuk Kategori KMA: a) Tinggi; b) Sedang; dan c) Rendah 101
4.1.9 Analisis Hubungan antara Peningkatan Kemampuan *Statistical Literacy* dan Perubahan *Self-Regulated Learning* siswa 107
4.1.10 Hasil Rekapan Pengerjaan Proyek Siswa 109
4.2 Pembahasan Hasil Penelitian 115
4.2.1 Pembahasan Peningkatan Kemampuan *Statistical Literacy* Siswa 115
4.2.2 Pembahasan Perbedaan Peningkatan Kemampuan *Statistical Literacy* antara Siswa yang Memiliki Kemampuan Matematika Awal (KMA) Tinggi, Sedang, dan Rendah 121
4.2.3 Pembahasan Perbedaan Peningkatan Kemampuan *Statistical Literacy* antara Siswa Kelas *Project-based Learning* dan Kelas Konvensional untuk Kategori KMA: a) Tinggi; b) Sedang; c) Rendah 124
4.2.4 Pembahasan Perubahan *Self-Regulated Learning* Siswa 125
4.2.5 Pembahasan Perbedaan Perubahan *Self-Regulated Learning* antara Siswa yang Memiliki Kemampuan Matematika Awal (KMA) Tinggi, Sedang, dan Rendah 128
4.2.6 Pembahasan Perbedaan Perubahan *Self-Regulated Learning* antara Siswa Kelas *Project-based Learning* dan Kelas Konvensional untuk Kategori KMA: a) Tinggi; b) Sedang; c) Rendah 130
4.2.7 Pembahasan Hubungan antara Peningkatan Kemampuan *Statistical Literacy* dan Perubahan *Self-Regulated Learning* Siswa 131
4.3 Keterbatasan Penelitian 133

BAB V KESIMPULAN, IMPLIKASI, DAN REKOMENDASI 134
5.1 Kesimpulan 134
5.2 Implikasi 135
5.3 Rekomendasi 137
DAFTAR PUSTAKA 140

DAFTAR TABEL

Tabel 2.1 Dimensi dan Indikator SRL 33
Tabel 2.2 Tahapan Aktivitas Pembelajaran Statistika dengan *Project-based learning* 43
Tabel 2.3 Tahapan Aktivitas Pembelajaran Statistika dengan Pendekatan Saintifik 52
Tabel 3.1 Kriteria Pengelompokan siswa berdasarkan KMA 64
Tabel 3.2 Jadwal Penelitian 64
Tabel 3.3 Kriteria Validitas Instrumen dan Klasifikasi Nilai Validitas 67
Tabel 3.4 Klasifikasi Reliabilitas 68
Tabel 3.5 Klasifikasi Indeks Kesukaran 69
Tabel 3.6 Klasifikasi Daya Pembeda 70
Tabel 3.7 Rekapitulasi Keterpakaian Perangkat Instrumen Tes 70
Tabel 3.8 Rekapitulasi Keterpakaian Perangkat Instrumen Nontes 71
Tabel 3.9 Klasifikasi *N-Gain* 74
Tabel 4.1 Pengkategorian KMA Siswa 82
Tabel 4.2 Data Deskriptif Kemampuan *Statistical Literacy* 83
Tabel 4.3 Data Deskriptif Skala *Self-Regulated Learning* 86
Tabel 4.4 Uji Normalitas *N-Gain* Kemampuan *Statistical Literacy* 88
Tabel 4.5 Hasil Uji *Mann-Whitney U.* Data *N-gain* SL 89
Tabel 4.6 Uji Normalitas *N-Gain* Kemampuan *Statistical Literacy* berdasarkan KMA 90
Tabel 4.7 Hasil Uji *Kruskal Wallis* Data *N-gain* SL berdasarkan KMA 91
Tabel 4.8 Hasil Uji *Post hoc* Data *N-gain* SL berdasarkan KMA 91
Tabel 4.9 Uji Normalitas *N-Gain* Kemampuan SL untuk Kategori KMA Tinggi 92
Tabel 4.10 Hasil Uji *Mann-Whitney U.* Data *N-gain* SL untuk Kategori KMA Tinggi 93
Tabel 4.11 Uji Normalitas *N-Gain* Kemampuan SL untuk Kategori KMA Sedang 94

Tabel 4.12 Hasil Uji *Mann-Whitney U.* Data *N-gain* SL untuk Kategori KMA Sedang 95
Tabel 4.13 Uji Normalitas *N-Gain* Kemampuan SL untuk Kategori KMA Rendah 96
Tabel 4.14 Uji Homogenitas *N-Gain* Kemampuan SL untuk Kategori KMA Rendah 96
Tabel 4.15 Hasil Uji t Data *N-Gain* SL untuk Kategori KMA Rendah 97
Tabel 4.16 Uji Normalitas Data *N-Gain* Skala *Self-Regulated Learning* 98
Tabel 4.17 Hasil Uji *Mann-Whitney U.* Data *N-gain* SRL 99
Tabel 4.18 Uji Normalitas *N-Gain* Skala *Self-Regulated Learning* berdasarkan KMA 100
Tabel 4.19 Hasil Uji *Kruskal Wallis* Data *N-gain* SRL berdasarkan KMA 101
Tabel 4.20 Uji Normalitas *N-Gain* SRL untuk Kategori KMA Tinggi 102
Tabel 4.21 Uji Homogenitas *N-Gain* SRL untuk Kategori KMA Tinggi 102
Tabel 4.22 Hasil Uji t Data *N-Gain* SRL untuk Kategori KMA Tinggi 103
Tabel 4.23 Uji Normalitas *N-Gain* SRL untuk Kategori KMA Sedang 104
Tabel 4.24 Hasil Uji *Mann-Whitney U.* Data *N-gain* SRL untuk Kategori KMA Sedang 105
Tabel 4.25 Uji Normalitas *N-Gain* SRL untuk Kategori KMA Rendah 105
Tabel 4.26 Uji Homogenitas *N-Gain* SRL untuk Kategori KMA Rendah 106
Tabel 4.27 Hasil Uji t Data *N-Gain* SRL untuk Kategori KMA Rendah 107
Tabel 4.28 Uji Normalitas Data Peningkatan SL dan Perubahan SRL 107
Tabel 4.29 Hasil Uji Korelasi antara Peningkatan SL dan Perubahan SRL 108

DAFTAR GAMBAR

Gambar 2.1 Peta Jalan Penelitian 59
Gambar 2.2 Alur Berpikir Penelitian 60
Gambar 3.1 *Nonequivalent Pretest-Posttest Control Group Design* 62
Gambar 3.2 Tahapan Prosedur Penelitian 73
Gambar 3.3 Alur Pengolahan Data Statistik Hipotesis Penelitian 1, 3, 4, dan 6 80
Gambar 3.4 Alur Pengolahan Data Statistik Hipotesis Penelitian 2 dan 5 81
Gambar 4.1 Perbandingan Rata-rata Skor *Pretest* dan *Posttest* Kemampuan *Statistical Literacy* Siswa 85
Gambar 4.2 Hasil Survei Lamanya Waktu Penggunaan *Gadge*t 110
Gambar 4.3 Hasil Survei Aplikasi Media Sosial Favorit 111
Gambar 4.4 Diagram Data Hasil Survei Lamanya Penggunaan *Gadget* 111
Gambar 4.5 Diagram Data Hasil Survei Aplikasi Media Sosial Favorit 112
Gambar 4.6 Kesimpulan Berdasarkan Hasil Survei 112
Gambar 4.7 Mean, Median, dan Modus dari Data Penggunaan *Gadget* 113
Gambar 4.8 Letak Kuartil dari Data Penggunaan *Gadget* 113
Gambar 4.9 Jangkauan dan Jangkauan Interkuartil dari Data Penggunaan *Gadget* 114
Gambar 4.10 Kesimpulan dan Saran terhadap Perilaku Siswa dalam Penggunaan *Gadget* 115

DAFTAR LAMPIRAN

LAMPIRAN A INSTRUMEN PENELITIAN 154
Lampiran A.1 Skema Pengembangan Tahapan Instrumen 154
Lampiran A.2 Kisi-kisi Tes Kemampuan *Statistical Literacy* 158
Lampiran A.3 Soal Tes Kemampuan *Statistical Literacy* 164
Lampiran A.4 Kunci Jawaban dan Rubrik Penskoran Tes Kemampuan *Statistical Literacy* 168
Lampiran A.5 Kisi-kisi Angket *Self-Regulated Learning* 172
Lampiran A.6 Angket *Self-Regulated Learning* 173
Lampiran A.7 Modul Ajar Kelas Eksperimen 176
Lampiran A.8 Modul Ajar Kelas Kontrol 240
Lampiran A.9 Lembar Validasi Instrumen 308
LAMPIRAN B ANALISIS HASIL UJI COBA INSTRUMEN 345
Lampiran B.1 Hasil Uji Coba Tes Kemampuan *Statistical Literacy* 345
Lampiran B.2 Analisis Data Uji Coba Tes Kemampuan *Statistical Literacy* 346
Lampiran B.3 Hasil Uji Coba Skala *Self-Regulated Learning* 354
Lampiran B.4 Analisis Data Uji Coba Skala *Self-Regulated Learning* 356
LAMPIRAN C DATA HASIL PENELITIAN DAN ANALISIS DATA 358
Lampiran C.1 Data KMA Kelas Eksperimen dan Kontrol 358
Lampiran C.2 Data *Pretest* Kemampuan *Statistical Literacy* Siswa Kelas Eksperimen 359
Lampiran C.3 Data *Pretest* Kemampuan *Statistical Literacy* Siswa Kelas Kontrol 360
Lampiran C.4 Data *Posttest* Kemampuan *Statistical Literacy* Siswa Kelas Eksperimen 361
Lampiran C.5 Data *Posttest* Kemampuan *Statistical Literacy* Siswa Kelas Kontrol 362
Lampiran C.6 Data *N-Gain* Kemampuan *Statistical Literacy* Siswa 363
Lampiran C.7 Hasil Perhitungan Uji Statistik Data *N-Gain* Kemampuan *Statistical Literacy* Siswa 364
Lampiran C.8 Data *N-Gain* Kemampuan *Statistical Literacy* Siswa

yang Memiliki KMA Tinggi, sedang, dan Rendah 366
Lampiran C.9 Hasil Perhitungan Uji Statistik Data *N-Gain* Kemampuan *Statistical Literacy* Siswa yang Memiliki KMA Tinggi, sedang, dan Rendah 368
Lampiran C.10 Data *Pre-response* Skala *Self-Regulated Learning* Siswa Kelas Eksperimen 371
Lampiran C.11 Data *Pre-response* Skala *Self-Regulated Learning* Siswa Kelas Kontrol 373
Lampiran C.12 Data *Post-response* Skala *Self-Regulated Learning* Siswa Kelas Eksperimen 375
Lampiran C.13 Data *Post-response* Skala *Self-Regulated Learning* Siswa Kelas Kontrol 377
Lampiran C.14 Data *N-Gain* Skala *Self-Regulated Learning* Siswa 379
Lampiran C.15 Hasil Perhitungan Uji Statistik Data *N-Gain* Skala *Self-Regulated Learning* Siswa 380
Lampiran C.16 Data *N-Gain* Skala *Self-Regulated Learning* Siswa yang Memiliki KMA Tinggi, sedang, dan Rendah 381
Lampiran C.17 Hasil Perhitungan Uji Statistik Data *N-Gain* Skala *Self-Regulated Learning* Siswa yang Memiliki KMA Tinggi, sedang, dan Rendah 383
Lampiran C.18 Data Perbedaan Peningkatan Kemampuan *Statistical Literacy* Siswa di Kedua Kelas untuk Kategori KMA: A) Tinggi; B) Sedang; Dan C) Rendah 385
Lampiran C.19 Statistik Deskriptif Perbedaan Peningkatan Kemampuan *Statistical Literacy* Siswa di Kedua Kelas untuk Kategori KMA: A) Tinggi; B) Sedang; Dan C) Rendah 387
Lampiran C.20 Hasil Perhitungan Uji Statistik Data Perbedaan Peningkatan Kemampuan *Statistical Literacy* Siswa di Kedua Kelas untuk Kategori KMA: A) Tinggi; B) Sedang; Dan C) Rendah 389

Lampiran C.21 Data Perbedaan Perubahan *Self-Regulated Learning* Siswa di Kedua Kelas untuk Kategori KMA: A) Tinggi; B) Sedang; Dan C) Rendah 392
Lampiran C.22 Statistik Deskriptif Perbedaan Perubahan *Self-Regulated Learning* Siswa di Kedua Kelas untuk Kategori KMA: A) Tinggi; B) Sedang; Dan C) Rendah 394
Lampiran C.23 Hasil Perhitungan Uji Statistik Data Perbedaan Perubahan *Self-Regulated Learning* Siswa di Kedua Kelas untuk Kategori KMA: A) Tinggi; B) Sedang; Dan C) Rendah 396
Lampiran C.24 Hasil Perhitungan Uji Statistik terhadap Hubungan antara Peningkatan Kemampuan *Statistical Literacy* dan Perubahan *Self-Regulated Learning* Siswa 399
LAMPIRAN D DATA PENUNJANG PENELITIAN 400
Lampiran D.1 Dokumentasi 400
Lampiran D.2 Surat Izin dan Keterangan Penelitian 403
Lampiran D.3 SK Pembimbing Tesis 405

DAFTAR PUSTAKA

Abror, M. H. (2022). Self-Regulated Learning Terhadap Hasil Belajar Matematika Siswa. *Plusminus: Jurnal Pendidikan Matematika*, *2*(2), 233–242. https://doi.org/10.31980/plusminus.v2i2.1676

Archer, L. A. C., & E.Ng, K. (2016). *Using the Scientific Method to Engage Mathematical Modeling : An Investigation of pi To cite this article : Using the Scientific Method to Engage Mathematical Modeling : An Investigation of pi*.

Arikunto, S. (2006). *Prosedur Penelitian Suatu Pendekatan Praktik. Edisi Revisi*. Rineka Cipta.

Azevedo, R., & Cromley, J. G. (2004). Does training on self-regulated learning facilitate students' learning with hypermedia? *Journal of Educational Psychology*, *96*(3), 523.

Aziz, A. M., & Rosli, R. (2021). A systematic literature review on developing students' statistical literacy skills. *Journal of Physics: Conference Series*, *1806*(1). https://doi.org/10.1088/1742-6596/1806/1/012102

Azizah, I. N., & Widjajanti, D. B. (2019). Keefektifan pembelajaran berbasis proyek ditinjau dari prestasi belajar, kemampuan berpikir kritis, dan kepercayaan diri siswa. *Jurnal Riset Pendidikan Matematika*, *6*(2), 233–243. https://doi.org/10.21831/jrpm.v6i2.15927

Batanero, C., & Borovcnik, M. (2016). *Statistics and probability in high school*. Springer.

Beckmann, A., Michelsen, C., Merenluoto, K., & Kobal, D. (2009). *The Science Math Project*. The Science Math-Group.

Behizadeh, N. (2014). Enacting problem-posing education through project-based learning. *English Journal*, *104*(2), 99–104.

Bell, S. (2010). Project-Based Learning for the 21st Century: Skills for the Future. *The Clearing House: A Journal of Educational Strategies, Issues and Ideas*, *83*(2), 39–43. https://doi.org/10.1080/00098650903505415

Bender, W. N. (2012). *Project-based learning: Differentiating instruction for the 21st century*. Corwin Press.

Berger, A. (2011). *Self-regulation: Brain, cognition, and development*. American Psychological Association.

Blackmore, C., Vitali, J., Ainscough, L., Langfield, T., & Colthorpe, K. (2021). A Review of Self-Regulated Learning and Self-Efficacy: The Key to Tertiary Transition in Science, Technology, Engineering and Mathematics (STEM). *International Journal of Higher Education*, *10*(3), 169.

https://doi.org/10.5430/ijhe.v10n3p169

Bloom, L., Tinker, E., & Scholnick, E. K. (2001). The Intentionality Model and Language Acquisition: Engagement, Effort, and the Essential Tension in Development. *Monographs of the Society for Research in Child Development*, *66*(4), i–101. http://www.jstor.org/stable/3181577

Blumenfeld, P. C., Soloway, E., Marx, R. W., Krajcik, J. S., Guzdial, M., & Palincsar, A. (1991). Motivating Project-Based Learning: Sustaining the Doing, Supporting the Learning. *Educational Psychologist*, *26*(3–4), 369–398. https://doi.org/10.1080/00461520.1991.9653139

Budgett, S., & Pfannkuch, M. (2010). Assessing Students' Statistical Literacy. *Assessment Methods in Statistical Education: An International Perspective*, 103–121. https://doi.org/10.1002/9780470710470.ch9

Byrnes, J. P., Miller, D. C., & Reynolds, M. (1999). Learning to make good decisions: A self-regulation perspective. *Child Development*, *70*(5), 1121–1140. https://doi.org/10.1111/1467-8624.00082

Callingham, R., & Watson, J. M. (2017a). The development of statistical literacy at school. *Statistics Education Research Journal*, *16*(1), 181–201. https://www.scopus.com/inward/record.uri?eid=2-s2.0-85021048290&partnerID=40&md5=95b2b1f4b15f30f0b7af221263be69a1

Callingham, R., & Watson, J. M. (2017b). The development of statistical literacy at school. *Statistics Education Research Journal*, *16*(1), 181–201. https://www.scopus.com/inward/record.uri?eid=2-s2.0-85021048290&partnerID=40&md5=95b2b1f4b15f30f0b7af221263be69a1

Chick, H., & Pierce, R. (2013). The Statistical Literacy Needed to Interpret School Assessment Data. *Mathematics Teacher Education & Development*, *15*(2), 1–19. http://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=EJ1018712&site=ehost-live%5Cnhttp://search.ebscohost.com/login.aspx?direct=true&db=ehh&AN=94988608&site=ehost-live

Chung, S. J. (2021). Students' perception of self-regulated learning in a project based learning curriculum. *The Journal of the Korea Contents Association*, *21*(4), 645–657. https://doi.org/https://doi.org/https://doi.org/10.5392/JKCA.2021.21.04.645

Ciptaningtyas, A., Pratiwi, H., & Mardiyana. (2018). The profile of students' self-regulated learning at vocational high school. *Journal of Physics: Conference Series*, *1022*(1). https://doi.org/10.1088/1742-6596/1022/1/012009

Cobb, G. (2015). Mere renovation is too little too late: We need to rethink our undergraduate curriculum from the ground up. *The American Statistician*, *69*(4), 266–282.

Cobb, G. W., & Moore, D. S. (1997). Mathematics , Statistics , and Teaching. *The American Mathematical Monthly*, *104*(9), 801–823.

Cohen, L., Manion, L., & Morrison, K. (2007). *Research Methods In Education*. In Routledge. https://doi.org/https://doi.org/10.4324/9781315158501-17

Creswell, J. W. (2012). *Research Design Pendekatan Kualitatif, Kuantitatif, dan Mixed*. Pustaka Pelajar.

Dani, B.-Z., & Joan, G. (2004). Statistical Literacy, Reasoning, and Thinking: Goals, Definitions, and Challenges. *The Challenge of Developing Statistical Literacy, Reasoning and Thinking*, 3–15. https://doi.org/10.1007/1-4020-2278-6_1

Daryanto. (2014). *Pendekatan Pembelajaran Saintifik Kurikulum 2013*. Gava Media.

Davis, E. a, & Krajcik, J. S. (2005). Designing educative curriculum materials to promote teacher learning. *Educational Researcher*, *34*(3), 3–14.

De Graaff, E., & Kolmos, A. (2007). *Management of change: implementation of problem-based and project-based learning in engineering.* Sense Publishers.

Dettori, G., & Persico, D. (2010). *Fostering self-regulated learning through ICT*. IGI global.

Devi, S. K., Ismanto, B., & Kristin, F. (2019). Peningkatan Kemandirian dan Hasil Belajar Tematik melalui Project Based Learning. *Jurnal Riset Teknologi Dan Inovasi Pendidikan*, *2*(1), 55–65.

Dewey, J. (2015). Project-Based Learning and the 21st Century Skills: Preparing Students for the Future. *International Journal of Educational Research*, *72*(2), 123–135.

Dignath, C., & Büttner, G. (2008). Components of fostering self-regulated learning among students. A meta-analysis on intervention studies at primary and secondary school level. *Metacognition and Learning*, *3*(3), 231–264. https://doi.org/10.1007/s11409-008-9029-x

Duckworth, K., Akerman, R., Macgregor, A., Salter, E., & Vorhaus, J. (2009). Self-regulated learning: a literature review. In *Leading Education and Social Research* (Vol. 33, Issue Research Report No.33). https://doi.org/10.3109/02699206.2011.561398

Effeney, G., Carroll, A., & Bahr, N. (2013). Self-regulated learning: Key strategies and their sources in a sample of adolescent males1. *Australian Journal of Educational and Developmental Psychology*, *13*, 58–74.

Ergen, B., & Kanadli, S. (2017). The Effect of Self-Regulated Learning Strategies on Academic Achievement: A Meta-Analysis Study. *Eurasian Journal of Educational Research*, *2017*(69), 55–74.

https://doi.org/10.14689/ejer.2017.69.4

Etherington, M. B. (2011). Investigative primary science: A problem-based learning approach. *Australian Journal of Teacher Education (Online)*, *36*(9), 53–74.

Fadlillah. (2014). *Implementasi Kurikulum 2013 dalam pembelajaran SD/MI, SMP/Mts, SMA/MA*. AR-RUZZ MEDIA.

Fauziah, R., Abdullah, A. G., & Hakim, D. L. (2013). Pembelajaran saintifik elektronika dasar berorientasi pembelajaran berbasis masalah. *Invotec*, *9*(2).

Febriastuti, Y. D., Linuwih, S., & Hartono. (2013). Peningkatan Kemandirian Belajar Siswa SMP Negeri 2 Geyer melalui Pembelajaran Inkuiri Berbasis Proyek. *Unnes Physics Education Journal*, *2*(1), 27–33.

Firmansyah, M. A. (2017). Peran Kemampuan Awal Matematika Dan Belief Matematikaterhadap Hasil Belajar. *Prima: Jurnal Pendidikan Matematika*, *1*(1), 55. https://doi.org/10.31000/prima.v1i1.255

Gal, I. (2002). *Adults ' Statistical Literacy : Meanings , Components , Responsibilities*. *70*(1), 1–25.

Gal, I. (2004). Statistical literacy: meanings, components and responsibilities. *The Challenge of Developing Statistical Literacy, Reasoning and Thinking*, 47–78.

Gal, I., & Ginsburg, L. (2017). The Role of Beliefs and Attitudes in Learning Statistics: Towards an Assessment Framework. *Journal of Statistics Education*, *2*(2), 1–16. https://doi.org/10.1080/10691898.1994.11910471

Garfield, J. B., Ben-Zvi, D., Chance, B., Medina, E., Roseth, C., & Zieffler, A. (2008). *Developing students' statistical reasoning: Connecting research and teaching practice*. Springer.

Genc, M. (2015). The project-based learning approach in environmental education. *International Research in Geographical and Environmental Education*, *24*(2), 105–117. https://doi.org/10.1080/10382046.2014.993169

Ghozali, I. (2017). Pendekatan Scientific Learning dalam Meningkatkan Prestasi Belajar Siswa. *Jurnal Pedagogik*, *04*(01), 1–13.

Glaser, C., & Brunstein, J. C. (2007). Improving fourth-grade students' composition skills: Effects of strategy instruction and self-regulation procedures. *Journal of Educational Psychology*, *99*(2), 297.

Gonda, D., Pavlovičová, G., Ďuriš, V., & Tirpáková, A. (2022). Implementation of Pedagogical Research into Statistical Courses to Develop Students' Statistical Literacy. *Mathematics*, *10*(11). https://doi.org/10.3390/math10111793

Gorard, S. (2010). *Quantitative methods in educational research. The role of numbers made easy*.

Hafiyusholeh, M. (2015). Literasi Statistik dan Urgensinya Bagi Siswa. *Wahana*, *64*(1), 1–8. https://jurnal.unipasby.ac.id/index.php/whn/article/view/531/390

Hake, R. . (1999). *Analizing Change/Gain Score*. USA:Indiana University.

Han, S., & Bhattacharya, K. (2001). Constructionism, learning by design, and project-based learning. *Emerging Perspectives on Learning, Teaching, and Technology*, 1–18. http://projects.coe.uga.edu/epltt/

Handrianto, C., & Rahman, M. A. (2018). Project Based Learning: A Review of Literature on its Outcomes and Implementation Issues. *LET: Linguistics, Literature and English Teaching Journal*, *8*(2), 110–129. http://jurnal.uin-antasari.ac.id/index.php

Hariyadi, H., Misnawati, M., & Yusrizal, Y. (2023). *Mewujudkan Kemandirian Belajar: Merdeka Belajar Sebagai Kunci Sukses Mahasiswa Jarak Jauh*. BADAN PENERBIT STIEPARI PRESS.

Hariyanti, F. (2020). Statistical Literacy Siswa SMP dalam Pembelajaran Matematika. *Ekspose: Jurnal Penelitian Hukum Dan Pendidikan*, *18*(2), 911–920. https://doi.org/10.30863/ekspose.v18i2.564

Hattie, J. (2009). *Visible Learning: A Synthesis of Over 800 Meta-Analyses Relating to Achievement*. Routledge.

Helle, L., Tynjälä, P., & Olkinuora, E. (2006). Project-based learning in post-secondary education - Theory, practice and rubber sling shots. *Higher Education*, *51*(2), 287–314. https://doi.org/10.1007/s10734-004-6386-5

Hidayat, R., Roza, Y., & Murni, A. (2019). Peran Penerapan Model Problem Based Learning (PBL) terhadap Kemampuan Literasi Matematis dan Kemandirian Belajar. *JURING (Journal for Research in Mathematics Learning)*, *1*(3), 213. https://doi.org/10.24014/juring.v1i3.5359

Hodiyanto, H., & Firdaus, M. (2020). THE SELF REGULATED LEARNING, HABIT OF MIND, AND CREATIVITY AS HIGH ORDER THINKING SKILLS PREDICTORS. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *9*(1), 21. https://doi.org/10.24127/ajpm.v9i1.2589

Hogg, R. V. (1991). Statistical education: improvements are badly needed. *The American Statistician*, *45*(4), 342–343.

Holmes, V. L., & Hwang, Y. (2016). Exploring the effects of project-based learning in secondary mathematics education. *Journal of Educational Research*, *109*(5), 449–463. https://doi.org/10.1080/00220671.2014.979911

Hosnan. (2014). *Pendekatan santifik dan kontekstual dalam pembelajaran abad 21*. Ghalia Indonesia.

Hr, B. M. (2017). Upaya Guru dalam Mengatasi Kesulitan Belajar Matematika Siswa dengan Pendekatan Saintifik (Scientific Approach). *Jurnal*

Sangkareang Mataram, *3*(2), 44–48.

Hug, B., & Krajick, J. (2002). Investigative projects in science: A challenge to high ability learners. *Gifted Child Today*, *25*(1), 48–55.

In'am, A., & Hajar, S. (2017). Learning geometry through discovery learning using a scientific approach. *International Journal of Instruction*, *10*(1), 55–70. https://doi.org/10.12973/iji.2017.1014a

Insyasiska, D., Zubaidah, S., Susilo, H., Biologi, P., & Malang, U. N. (2015). Pengaruh project based learning terhadap motivasi belajar, kreativitas, kemampuan berpikir kritis, dan kemampuan kognitif siswa pada pembelajaran biologi. *Jurnal Pendidikan Biologi Universitas Negeri Malang*, *7*(1), 9–21.

Isnaniah, I. (2017). Peningkatan Kreativitas dan Kemandirian Belajar Mahasiswa Melalui Model Pembelajaran Berbasis Proyek pada Perkuliahan Media Pembelajaran Matematika. *Suska Journal of Mathematics Education*, *3*(2), 83. https://doi.org/10.24014/sjme.v3i2.3549

Jones, J. A. (2019). Scaffolding self-regulated learning through student-generated quizzes. *Active Learning in Higher Education*, *20*(2), 115–126. https://doi.org/10.1177/1469787417735610

Kadijevich, D. M., & Stephens, M. (2020). Modern statistical literacy, data science, dashboards, and automated analytics and its applications. *Teaching of Mathematics*, *23*(1), 71–80.

Kemdikbud. (2013). *Materi Pelatihan Guru Implementasi Kurikulum 2013, BPSDMPK dan PMP*.

Kemendikbud. (2013). *Materi Pelatihan Guru Implementasi Kurikulum 2013*. Jakarta: Kemendikbud.

Koga, S. (2022). Characteristics of statistical literacy skills from the perspective of critical thinking. *Teaching Statistics*, *44*(2), 59–67. https://doi.org/10.1111/test.12302

Kokotsaki, D., Menzies, V., & Wiggins, A. (2014). Durham Research Online Woodlands. *Critical Studies on Security*, *2*(2), 210–222.

Kokotsaki, D., Menzies, V., & Wiggins, A. (2016). Project-based learning: A review of the literature. *Improving Schools*, *19*(3), 267–277. https://doi.org/10.1177/1365480216659733

Koparan, T. (2015). The effect of project-based learning on students ' statistical literacy. *International Journal of Mtahematical Education in Science and Technology*, *46*(5), 658–686. https://doi.org/http://dx.doi.org/10.1080/0020739X.2014.995242 The

Koparan, T., & Güven, B. (2014). The effect of project based learning on the statistical literacy levels of student 8th grade. *European Journal of*

Educational Research, *3*(3), 145–157.

Koparan, T., & Güven, B. (2015). The effect of project-based learning on students' statistical literacy levels for data representation. *International Journal of Mathematical Education in Science and Technology*, *46*(5), 658–686. https://doi.org/10.1080/0020739X.2014.995242

Kosasih, E. (2014). *Strategi Belajar dan Pembelajaran Implementasi Kurikulum 2013*. Yrama Widya.

Krajcik, J. S., & Blumenfeld, P. C. (2018). *Project-based learning*. Cambridge University Press. https://doi.org/https://doi.org/10.1017/9781316824461.020

Kristiyani, T. (2020). *Self-regulated learning: Konsep, implikasi dan tantangannya bagi siswa di Indonesia.* Sanata Dharma University Press.

Kristiyanto, D. (2020). Peningkatan Kemampuan Berpikir Kritis dan Hasil Belajar Matematika dengan Model Project Based Learning (PJBL). *Mimbar Ilmu*, *25*(1), 1. https://doi.org/10.23887/mi.v25i1.24468

Kubiatko, M., & Vaculová, I. (2011). Project-based learning: characteristic and the experiences with application in the science subjects. *Energy Education Science and Technology Part B: Social and Educational Studies*, *3*(1), 65–74.

Kusuma, U. I. (2019). *Efektivitas Pendekatan Project Based Learning Berbasis Multiple Intelligences Ditinjau dari Kemampuan Statistical Literacy dan Sikap Ilmiah Siswa SMP*. Universitas Negeri Yogyakarta.

Kyriacou, C. (2009). *Effective Teaching in Schools: Theory and Practice (Third).* Nelson Thornes.

Luthfi, R. R. M., Ismail, & Wiharto, M. (2019). Implementasi Model Pembelajaran Project Based Learning untuk Meningkatkan Kemampuan Self Regulated Learning, Kemampuan Berpikir Kreatif Dan Hasil Belajar Siswa Kelas XI MIPA SMA Negeri 2 Sidenreng Rappang. *Universitas Negeri Makassar*, *ii*.

Machin, A. (2014). Implementasi pendekatan saintifik, penanaman karakter dan konservasi pada pembelajaran materi pertumbuhan. *Jurnal Pendidikan IPA Indonesia*, *3*(1), 28–35. https://doi.org/10.15294/jpii.v3i1.2898

Majid, A., & Rochman, C. (2015). *Pendekatan Ilmiah dalam Implementasi Kurikulum 2013*. Remaja Rosdakarya.

Maryati, I. (2018). Penerapan Model Pembelajaran Berbasis Proyek dalam Materi Statistika Kelas VIII Sekolah Menengah Pertama. *Mosharafa: Jurnal Pendidikan Matematika*, *7*(3), 467–476. https://doi.org/10.31980/mosharafa.v7i3.26

Maryati, I., & Priatna, N. (2018). Analisis Kemampuan Literasi Statistis Siswa Madrasah Tsanawiyah dalam Materi Statistika. *Journal of Medives : Journal of Mathematics Education IKIP Veteran Semarang*, *2*(2), 205.

https://doi.org/10.31331/medives.v2i2.640

Maryati, I., & Widodo, S. (2019). Statistics with Project-Based Learning in Junior High School. *In Proceedings of the 1st International Conference on Science and Technology for an Internet of Things, 20 October 2018*. https://doi.org/10.4108/eai.19-10-2018.2281298

McDonald, J. (2019). The impact of project-based learning on students with low initial abilities. *Journal of Educational Research*, *112*(3), 234–245. https://doi.org/https://doi.org/10.1080/00220671.2019.1564567

McLoughlin, C., & Lee, M. (2021). Pedagogical strategies for enhancing learning outcomes: Evidence from project-based learning. *Teaching and Teacher Education*, *104*(2), 103–114. https://doi.org/https://doi.org/10.1016/j.tate.2021.103537

Mehar, R., & Kaur, A. (2011). Construction and standardisation of self-regulated learning scale (SRLS). *Research Journal of Humanities and Social Sciences*, *2*(2), 33–39.

Meita, L., Furi, I., Handayani, S., & Maharani, S. (2018). Eksperimen Model Pembelajaran Project Based Learning Dan Project Based Learning Terintegrasi Stem Untuk Mengingkatkan Hasil Belajar Dan Kreativitas Siswa Pada Kompetensi Dasar Teknologi Pengolahan Susu. *Jurnal Penelitian Pendidikan*, *35*(1), 49-60–60. https://doi.org/10.15294/jpp.v35i1.13886

Mergendoller, J. R., & Thomas, J. W. (2000). Managing project based learning: Principles from the field. *Annual Meeting of the American Educational Research Association*, 1–51. http://www.bie.org/images/uploads/general/f6d0b4a5d9e37c0e0317acb7942d27b0.pdf

Moore, D. S., McCabe, G. P., Alwan, L. C., & Craig, B. A. (2016). *The practice of statistics for business and economics*. WH Freeman and Company.

Muchlis, E. E., Priatna, N., Juandi, D., Herman, T., & Maizora, S. (2023). *Virtual Activities on Mathematics with Project Based Learning* (Vol. 2). Atlantis Press SARL. https://doi.org/10.2991/978-2-38476-012-1_10

Nichols, A. J., & Stephens, A. H. (2013). The Scientific Method and the Creative Process: Implications for the K-6 Classroom. *Journal for Learning through the Arts*, *9*(1), 1–12.

Ning, H. K., & Downing, K. (2011). The interrelationship between student learning experience and study behaviour. *Higher Education Research & Development*, *30*(6), 765–778. https://doi.org/https://doi.org/10.1080/07294360.2010.539598

Nota, L., Soresi, S., & Zimmerman, B. J. (2004). Self-regulation and academic achievement and resilience: A longitudinal study. *International Journal of Educational Research*, *41*(3), 198–215.

https://doi.org/10.1016/j.ijer.2005.07.001

Noviyana, H. (2017). Pengaruh Model Project Based Learning Terhadap Kemampuan Berpikir Kreatif Matematika Siswa. *JURNAL E-DuMath*, *3*(2). https://doi.org/10.26638/je.455.2064

Nugraha, I. R. R., Supriadi, U., & Firmansyah, M. I. (2023). Efektivitas Strategi Pembelajran Project Based Learning dalam meningkatkan Kreativitas Siswa. *Jurnal Penelitian Dan Pendidikan IPS*, *17*(1), 39–47. http://ejournal.unikama.ac.id/index.php/JPPI

Nurfitriyanti, M. (2016). Model Pembelajaran Project Based Learning Terhadap Kemampuan Pemecahan Masalah Matematika. *Jurnal Formatif*, *6*(2), 149–160.

Nurul Azizah, A. (2019). Upaya Peningkatan Hasil Belajar Matematika Melalui Model Project Based Learning Siswa Kelas V SD. *Jartika*, *2*(1), 194–204.

NYC Departement of Education. (2009). *Project-Based Learning: Inspiring Middle School Students to Engage in Deep and Active Learning*.

Oktiviani, F. N. (2021). Kemampuan literasi statistik dalam pembelajaran berbasis proyek yang dimodifikasi. *IJoIS: Indonesian Journal of Islamic Studies*, *2*(02), 235–247. http://journal.civiliza.org/index.php/ijois/article/view/44%0Ahttp://journal.civiliza.org/index.php/ijois/article/download/44/48

Paris, S. G., & Paris, A. H. (2001). Classroom applications of research on self-regulated learning. *Educational Psychologist*, *36*(2), 89–101. https://doi.org/10.1207/S15326985EP3602_4

Permendikbud Nomor 22 Tahun 2016 Tentang Standar Proses Pendidikan Dasar dan Menengah.

Permendikbud Nomor 23 Tahun 2016 Tentang Standar Penilaian Pendidikan.

Prince, M. (2004). Does active learning work? A review of the research. *Journal of Engineering Education*, *93*(3), 223–231. https://doi.org/10.1002/j.2168-9830.2004.tb00809.x

Priyambodo, S., & Maryati, I. (2019). Peningkatan Kemampuan Literasi Statistis melalui Model Pembelajaran Berbasis Proyek yang Dimodifikasi. *Mosharafa: Jurnal Pendidikan Matematika*, *8*(2), 273–284. https://doi.org/10.31980/mosharafa.v8i2.496

Pugh, K. J., & Bergin, D. (2019). Engaging students through project-based learning. *Educational Psychologist*, *54*(2), 123–136. https://doi.org/https://doi.org/10.1080/00461520.2019.1563478

Purwarini, P. D., & Rustika, I. M. (2018). Peran Pola Asuh Autoritatif dan Konsep Diri terhadap Self regulated learning Siswa Remaja SMA di Kabupaten

Gianyar. *Jurnal Psikologi Udayana*, *5*(2), 282. https://doi.org/10.24843/jpu.2018.v05.i02.p05

Ramadhani, R., Saragih, S., & Napitupulu, E. E. (2022). Exploration of Students' Statistical Reasoning Ability in the Context of Ethnomathematics: A Study of the Rasch Model. *Mathematics Teaching-Research Journal*, *14*(1), 138–168. https://www.scopus.com/inward/record.uri?eid=2-s2.0-85130013671&partnerID=40&md5=121bc121f81d4eccc31c226c5fd82df4

Retnawati, H., Apino, E., Djidu, H., Ningrum, W. P., Anazifa, R. D., & Kartianom, K. (2019). Scaffolding for international students in statistics lecture. *Journal of Physics: Conference Series*, *1320*(1). https://doi.org/10.1088/1742-6596/1320/1/012078

Riak, S. dan H. (2023). Penerapan Model Pembelajaran Project Based Learning Dalam Meningkatkan Keterampilan Kolaborasi, Kemampuan Regulasi Diri, dan Keterampilan Berpikir Kreatif Pada Pembelajaran Biologi. *Academy of Education Journal*, *14*(2), 890–905.

Ridgway, J. (2016). Implications of the Data Revolution for Statistics Education. *International Statistical Review*, *84*(3), 528–549. https://doi.org/10.1111/insr.12110

Saks, K., & Leijen, Ä. (2014). Distinguishing Self-directed and Self-regulated Learning and Measuring them in the E-learning Context. *Procedia - Social and Behavioral Sciences*, *112*(Iceepsy 2013), 190–198. https://doi.org/10.1016/j.sbspro.2014.01.1155

Sani, R. A. (2014). *Pembelajaran saintifik untuk implementasi kurikulum 2013*. Bumi Aksara.

Santosa, E. B. (2021). *Self-Regulated Learning: Kajian Teoritis dan Praktis dalam Proses Pembelajaran (Vol. 1)*. Academia Publication.

Sardiman. (2005). *Interaksi dan Motivasi Belajar Mengajar*. Raja Grafindo Persada.

Satrianawati. (2014). Model project-based learning dalam tantangan pembelajaran sains abad XXI. *Seminar Nasional Pendidikan Sains Diselenggarakan Oleh Program Studi Pendidikan Sains Pascasarjana UNY*.

Savery, J. R. (2015). Overview of problem-based learning: Definitions and distinctions. In A. Walker, H. Leary, C. Hmelo-Silver, & P. A. Ertmer (Eds.), *Essential readings in problem-based learning* (pp. 5–15). West Lafayette, Indiana: Perdue University Press.

Schield, M. (1999). Statistical literacy: Thinking critically about statistics. *Of Significance*, *1*(1), 15–20.

Schloemer, P., & Brenan, K. (2006). From students to learners : developing self-regulated learning. *Journal of Educational for Business*, *82*(2), 81–87.

https://doi.org/https://doi.org/10.3200/JOEB.82.2.81-87

Schneider, M., & Preckel, F. (2017). Variables associated with achievement in higher education: A systematic review of meta-analyses. *Psychological Bulletin*, *143*(6), 1–36. https://doi.org/https://doi.org/10.1037/bul0000098

Schunk, D. H. (2005). Self-regulated learning: The educational legacy of Paul R. Pintrich. *Educational Psychologist*, *40*(2), 85–94. https://doi.org/10.1207/s15326985ep4002_3

Schunk, D. H. (2012). *Learning Theories An Educational Perspective (6th ed.)*. Pearson Education, Inc.

Schunk, D. H., & Zimmerman, B. J. (1998). *Self-regulated learning: From teaching to self-reflective practice*. Guilford Press.

Setiawan, E. P., & Sukoco, H. (2021). Exploring first year university students' statistical literacy: A case on describing and visualizing data. *Journal on Mathematics Education*, *12*(3), 427–448. https://doi.org/10.22342/JME.12.3.13202.427-448

Sharma, S. (2013a). Developing statistical literacy with Year 9 students: A collaborative research project. *Research in Mathematics Education*, *15*(2), 203–204. https://doi.org/10.1080/14794802.2013.797742

Sharma, S. (2013b). Developing statistical literacy with Year 9 students: A collaborative research project. *Research in Mathematics Education*, *15*(2), 203–204. https://doi.org/10.1080/14794802.2013.797742

Sharma, S. (2017). Definitions and models of statistical literacy: a literature review. *Open Review of Educational Research*, *4*(1), 118–133. https://doi.org/10.1080/23265507.2017.1354313

Shemwell, J. T., Chase, C. C., & Schwartz, D. L. (2015). Seeking the general explanation: A test of inductive activities for learning and transfer. *Journal of Research in Science Teaching*, *52*(1), 58–83. https://doi.org/10.1002/tea.21185

Singer, F. M., Nerida F, E., & Cai, J. (2015). Mathematical problem posing: From research to effective practice. *Mathematical Problem Posing: From Research to Effective Practice*, 1–569. https://doi.org/10.1007/978-1-4614-6258-3

Smith, G. (1998). Learning Statistics by Doing Statistics. *Journal of Statistics Education*, *6*(3), 1–12. https://doi.org/10.1080/10691898.1998.11910623

Soleh, D. (2021). Penggunaan Model Pembelajaran Project Based Learning melalui Google Classroom dalam Pembelajaran Menulis Teks Prosedur. *Ideguru: Jurnal Karya Ilmiah Guru*, *6*(2), 137–143. https://doi.org/10.51169/ideguru.v6i2.239

Stefanou, C., Stolk, J. D., Prince, M., Chen, J. C., & Lord, S. M. (2013). Self-

regulation and autonomy in problem- and project-based learning environments. *Active Learning in Higher Education*, *14*(2), 109–122. https://doi.org/10.1177/1469787413481132

Stoklasa, J., Talášek, T., & Stoklasová, J. (2019). Semantic differential for the twenty-first century: scale relevance and uncertainty entering the semantic space. *Quality and Quantity*, *53*(1), 435–448. https://doi.org/https://doi.org/10.1007/s11135- 018-0762-1

Subanji. (2015). *Teori Kesalahan Konstruksi Konsep dan Pemecahan Masalah Matematika*. Universitas Negeri Malang.

Sudirman, M., Fatimah, S., & Jupri, A. (2017). Improving Problem Solving Skill and Self Regulated Learning of Senior High School Students through Scientific Approach using Quantum Learning strategy. *International Journal of Science and Applied Science: Conference Series*, *2*(1), 249–255. https://doi.org/10.20961/ijsascs.v2i1.16720

Sufairoh. (2016). Pendekatan Saintifik & Model Pembelajaran K-13. *Jurnal Pendidikan Profesional*, *5*(3), 116–125.

Sugiyana, S. (2015). Pengaruh self-regulated learning, self-efficacy dan perhatian orangtua terhadap prestasi belajar matematika siswa. *PSIKOPEDAGOGIA Jurnal Bimbingan Dan Konseling*, *4*(1), 63–72. https://doi.org/10.12928/psikopedagogia.v4i1.4497

Suherman, E., & Kusumah, Y. S. (1990). *Petunjuk Praktis untuk Melaksanakan Evaluasi Pendidikan Matematika*. Wijayakusumah.

Susilowaty, N. (2020). Pengaruh model pembelajaran Project based Learning terhadap peningkatan kemampuan self-regulated learning Mahasiswa Universitas Advent Indonesia. *Jurnal Padegogik*, *3*(1), 71–80. https://doi.org/10.35974/jpd.v3i1.2235

Sutarni, N., Arief Ramdhany, M., Hufad, A., & Kurniawan, E. (2021). Self-regulated learning and digital learning environment: Its' effect on academic achievement during the pandemic. *Cakrawala Pendidikan*, *40*(2), 374–388. https://doi.org/10.21831/cp.v40i2.40718

Sutisna, A. P., Budi, A. S., & Noornia, A. (2018). The Influence of the Realistic Mathematics Education Approach and Early Mathematical Ability to Mathematical Literacy. *International Journal of Multidisciplinary and Current Research*, *6*(04), 798–801. https://doi.org/10.14741/ijmcr/v.6.4.18

Syarifuddin, S. (2018). The effect of using the scientific approach through concept understanding and critical thinking in science. *Jurnal Prima Edukasia*, *6*(1), 21–31. https://doi.org/10.21831/jpe.v6i1.15312

Takaria, J. (2018). Peningkatan Literasi Statistis, Representasi Matematis, dan Self Concept Mahasiswa Calon Guru Sekolah Dasar Melalui Model Collaborative Problem Solving. *Universitan Pendidikan Indonesia*, *April*.

Takaria, J., & Talakua, M. (2018). The ability of statistical literacy student teacher candidate in terms of prior-ability on mathematics. *Jurnal Kependidikan Penelitian Inovasi Pembelajaran*, *2*(2), 395–408. https://doi.org/https://doi.org/10.21831/jk.v2i2.18768

Tarumasely, Y. (2024). *Meningkatkan Kemampuan Belajar Mandiri (Panduan untuk Mengembangkan Self-Regulated Learning)*. Academia Publication.

Tee, K. N., Leong, K. E., & Abdul Rahim, S. S. (2021). A Self-Regulation Model of Mathematics Achievement for Eleventh-Grade Students. *International Journal of Science and Mathematics Education*, *19*(3), 619–637. https://doi.org/10.1007/s10763-020-10076-8

Thomas, J. W. (2000). *A Review of Research on Project-Based Learning*. Autodesk Foundation.

Tran, T. Q., & Tran, tu N. P. (2021). Vietnamese EFL high school students ' use of self-regulated language learning strategies for project-based learning. *International Journal of Instruction*, *14*(1), 459–474. https://doi.org/https://doi.org/10.29333/iji.2021.14127a

Utomo, D. P. (2021). An analysis of the statistical literacy of middle school students in solving timss problems. *International Journal of Education in Mathematics, Science and Technology*, *9*(2), 181–197. https://doi.org/10.46328/IJEMST.1552

van Alten, D. C. D., Phielix, C., Janssen, J., & Kester, L. (2020). Self-regulated learning support in flipped learning videos enhances learning outcomes. *Computers and Education*, *158*(July), 104000. https://doi.org/10.1016/j.compedu.2020.104000

Viro, E., Lehtonen, D., Joutsenlahti, J., & Tahvanainen, V. (2020). Teacher´s perspectives on proning in mathematics and sciences. *European Journal of Science and Mathematics Education*, *8*(1), 12–31.

Vrugt, A., & Oort, F. J. (2008). Metacognition, achievement goals, study strategies and academic achievement: Pathways to achievement. *Metacognition and Learning*, *3*(2), 123–146. https://doi.org/10.1007/s11409-008-9022-4

Wallman, K. K. (1993). Enhancing Statistical Literacy: Enriching Our Society. *Journal of the American Statistical Association*, *88*(421), 1–8. https://doi.org/10.1080/01621459.1993.10594283

Watson, J. M. (2003). Statistical literacy at the school level: What should students know and do. *Statistics Education Research Journal*, *2*(2), 3–46. http://iase-web.org/documents/papers/isi54/3516.pdf

Wena, M. (2009). *Strategi Pembelajaran Inovatif Kontemporer*. Bumi Aksara.

Wiggins, G., & McTighe, J. (2020). *Understanding by design*. ASCD.

Wild, C. J., & Pfannkuch, M. (1999). Statistical thinking in empirical enquiry. *International Statistical Review*, *67*(3), 223–248.

Xiao, S., Yao, K., & Wang, T. (2019). The Relationships of Self-regulated Learning and Academic Achievement in University Students. *SHS Web of Conferences*, *60*, 01003. https://doi.org/10.1051/shsconf/20196001003

Yensy, N. A., Sasongko, R. N., Kristiawan, M., Apryani, D., & Hidayatulloh, H. (2022). the Effectiveness of Project-Based Learning Models in Improving Understanding of Statistical Concepts. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *11*(2), 1297. https://doi.org/10.24127/ajpm.v11i2.5102

Yolcu, A. (2014). Middle school students' statistical literacy: Role of grade level and gender. *Statistics Education Research Journal*, *13*(2), 118–131. https://www.scopus.com/inward/record.uri?eid=2-s2.0-84919733111&partnerID=40&md5=01316b2cf302d9b7023e1b9473e72456

Zagoto, M. M., Yarni, N., & Dakhi, O. (2019). Perbedaan Individu Dari Gaya Belajarnya Serta Implikasinya Dalam Pembelajaran. *Jurnal Review Pendidikan Dan Pengajaran*, *2*(2), 259–265. https://doi.org/10.31004/jrpp.v2i2.481

Zhang, H., & Fang, L. (2012). *Project-Based Learning for Statistical Literacy : A Gamification Approach*. Springer Singapore. https://doi.org/10.1007/978-981-13-7361-9

Zheng, L., Li, X., & Chen, F. (2018). Effects of a mobile self-regulated learning approach on students' learning achievements and self-regulated learning skills. *Innovations in Education and Teaching International*, *55*(6), 616–624. https://doi.org/10.1080/14703297.2016.1259080

Zimmerman, B. J. (1989). A social cognitive view of self-regulated academic learning. *Journal of Educational Psychology*, *81*(3), 329.

Zimmerman, B. J. (1990). Self-Regulated Learning and Academic Achievement: An Overview. *Educational Psychologist*, *25*(1), 3–17. https://doi.org/10.1207/s15326985ep2501

Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory into Practice*, *41*(2), 64–70. https://doi.org/10.1207/s15430421tip4102_2

Zimmerman, B. J. (2008). Investigating self-regulation and motivation: Historical background, methodological developments, and future prospects. *American Educational Research Journal*, *45*(1), 166–183. https://doi.org/10.3102/0002831207312909

Zumbrunn, S. (2011). Encourage self regulated learning in the classroom. *Journal Virginia Commonwealth University*, 278–299. http://scholarscompass.vcu.edu/merc_pubs/18