ABSTRAK

Istiyarso, Robertus Budi. 2022. Analisis Kemampuan Pemecahan Masalah dan Representasi Mahasiswa Program Studi Pendidikan Matematika Universitas Sanata Dharma Yogyakarta untuk Mata Kuliah Geometri Ruang Setelah Mengalami Proses Pembelajaran dengan Pendekatan Pendidikan Matematika Realistik dan Strategi *Flipped Classroom*. Tesis. Program Studi Pendidikan Matematika Program Magister, Jurusan Pendidikan Matematika dan Ilmu Pengetahuan Alam, Fakultas Keguruan dan Ilmu Pendidikan, Universitas Sanata Dharma, Yogyakarta.

Penelitian ini bertujuan untuk (1) mendeskripsikan rancangan dan pelaksanaan proses pembelajaran dengan menggunakan pendekatan Pendidikan Matematika Realistik dan strategi *Flipped Classroom* untuk membelajarkan materi jarak pada dimensi tiga pada kuliah Geometri Ruang bagi mahasiswa; (2) mendeskripsikan kemampuan pemecahan masalah mahasiswa setelah mengalami pembelajaran menggunakan pendekatan Pendidikan Matematika Realistik dan strategi *Flipped Classroom* untuk materi jarak pada dimensi tiga pada kuliah Geometri Ruang; dan (3) mendeskripsikan kemampuan representasi mahasiswa setelah mengalami pembelajaran menggunakan pendekatan Pendidikan Matematika Realistik dan strategi *Flipped Classroom* untuk materi jarak pada dimensi tiga pada kuliah Geometri Ruang. Penelitian ini merupakan penelitian desain. Subjek penelitian ini adalah mahasiswa semester genap Program Studi Pendidikan Matematika Universitas Sanata Dharma Yogyakarta tahun akademik 2020/2021 yang mengambil mata kuliah Geometri Ruang. Objek penelitian ini adalah proses merencanakan dan melaksanakan pembelajaran dengan pendekatan Pendidikan Matematika Realistik (PMR) dan strategi *Flipped Classroom* dalam membelajarkan materi jarak pada dimensi tiga pada kuliah Geometri Ruang; serta kemampuan pemecahan masalah dan representasi mahasiswa setelah mengalami proses pembelajaran dengan menggunakan pendekatan PMR dan strategi *Flipped Classroom*. Metode yang digunakan dalam pengumpulan data adalah catatan harian, tes tertulis, dan wawancara. Teknik analisis data pada penelitian ini adalah reduksi data, penyajian data, penarikan kesimpulan, dan verifikasi.

Penelitian menghasilkan *Hypothetical Learning Trajectory* (HLT) untuk materi jarak dalam dimensi tiga yang disusun menggunakan karakteristik pendekatan PMR dan fase-fase strategi *flipped classroom*. Langkah-langkah membelajarkan materi tersebut adalah sebagai berikut: (1) peneliti menyiapkan bahan ajar yang digunakan, (2) mahasiswa mempelajari materi melalui video pembelajaran (secara asinkronus), (3) mahasiswa menerapkan materi pada video untuk menyelesaikan masalah yang berkaitan dengan jarak dalam dimensi tiga (secara daring sinkronus dengan media Zoom Meeting), dan (4) mahasiswa menarik kesimpulan selesai pembelajaran.

Kemampuan pemecahan masalah merupakan kemampuan seseorang dalam berusaha mencari jalan keluar dari suatu permasalahan, dengan mengidentifikasi hal-hal yang diperlukan, menyusun suatu model, memilih dan mengembangkan strategi pemecahan, serta menjelaskan dan memeriksa jawaban yang diperoleh. Aspek kemampuan pemecahan masalah dalam penelitian ini adalah memahami masalah; membuat rencana pemecahan masalah; melaksanakan rencana pemecahan masalah; dan melihat (mengecek)

kembali. Dari hasil tes untuk kelas uji coba, diperoleh (1) pada masalah 1, sebanyak 92% mahasiswa mencapai satu indikator, yaitu memahami masalah; (2) pada masalah 2, sebanyak 15% mahasiswa mencapai keempat indikator, sebanyak 74% mahasiswa mencapai satu indikator, yaitu memahami masalah; (3) pada masalah 3, sebanyak 7% mahasiswa mencapai keempat indikator, sebanyak 74% mahasiswa mencapai satu aspek, yaitu memahami masalah. Dari hasil tes untuk kelas penelitian, diperoleh (1) pada masalah 1, sebanyak 3% mahasiswa mencapai dua indikator, yaitu memahami masalah dan membuat rencana pemecahan masalah, sebanyak 89% mahasiswa mencapai satu indikator, yaitu memahami masalah; (2) pada masalah 2, sebanyak 21% mahasiswa mencapai keempat indikator, sebanyak 75% mahasiswa mencapai satu indikator, yaitu memahami masalah; (3) pada masalah 3, sebanyak 14% mahasiswa mencapai keempat indikator, sebanyak 7% mahasiswa mencapai dua indikator, yaitu memahami masalah dan membuat rencana pemecahan masalah, sebanyak 64% mahasiswa mencapai satu indikator, yaitu memahami masalah.

Kemampuan representasi merupakan suatu kemampuan seseorang untuk mengungkapkan suatu ide dalam bentuk tertentu, baik dalam bentuk tabel, simbol, notasi, grafik, ataupun sampai dapat membuat kesimpulan dengan bahasanya sendiri baik secara formal maupun informal. Aspek kemampuan representasi yang digunakan dalam penelitian ini adalah representasi visual; representasi persamaan atau ekspresi matematis; dan representasi kata-kata atau teks tertulis. Dari hasil tes untuk kelas uji coba, diperoleh (1) pada masalah 1, sebanyak 92% mahasiswa mencapai satu indikator, yaitu representasi visual; (2) pada masalah 2, sebanyak 15% mahasiswa mencapai ketiga indikator, sebanyak 74% mahasiswa mencapai satu indikator, yaitu representasi visual; (3) pada masalah 3, sebanyak 7% mahasiswa mencapai ketiga indikator, sebanyak 74% mahasiswa mencapai satu aspek, yaitu representasi visual. Dari hasil tes untuk kelas penelitian, diperoleh (1) pada masalah 1, sebanyak 3% mahasiswa mencapai dua aspek, yaitu representasi visual dan representasi persamaan atau ekspresi matematis, sebanyak 89% mahasiswa mencapai satu aspek, yaitu representasi visual; (2) pada masalah 2, sebanyak 21% mahasiswa mencapai ketiga indikator, sebanyak 75% mahasiswa mencapai satu aspek, yaitu representasi visual; (3) pada masalah 3, sebanyak 14% mahasiswa mencapai ketiga aspek, sebanyak 7% mahasiswa mencapai dua indikator, yaitu representasi visual dan representasi persamaan atau ekspresi matematis, sebanyak 64% mahasiswa mencapai satu indikator, yaitu representasi visual.

Kata kunci: Pendidikan Matematika Realistik, *flipped classroom*, kemampuan pemecahan masalah, kemampuan representasi, dan penelitian desain

ABSTRACT

Istiyarso, Robertus Budi. 2022. Analysis of Problem Solving and Representation Ability of Student of Mathematics Education Study Program, Universitas Sanata Dharma Yogyakarta for Solid Geometry Course after Experiencing the Learning Process with Realistic Mathematics Education Approach and Flipped Classroom Strategy. Graduated Thesis. Magister of Mathematics Education Study Program, Department of Mathematics and Natural Sciences, Faculty of Teacher Training and Education, Universitas Sanata Dharma, Yogyakarta.

The aim of the research were to know (1) describe the design and implementation of the learning process using the Realistic Mathematics Education approach and the Flipped Classroom strategy to teach distance material in three dimensions in the Solid Geometry course for students; (2) describe the problem solving ability of students after experiencing learning using the Realistic Mathematics Education approach and the Flipped Classroom strategy for distance material in three dimensions in the Solid Geometry course; and (3) describe students' representational abilities after experiencing learning using the Realistic Mathematics Education approach and the Flipped Classroom strategy for distance material in three dimensions in the Solid Geometry course. This research is a design research. The subjects of this study were even semester students of the Mathematics Education Study Program, Universitas Sanata Dharma, Yogyakarta for the 2020/2021 academic year who took the Solid Geometry course. The object of this research is the process of planning and implementing learning with Realistic Mathematics Education (PMR) approach and Flipped Classroom strategy in teaching distance material in three dimensions in the Solid Geometry course; as well as problem solving and student representation skills after experiencing the learning process using the PMR approach and the Flipped Classroom strategy. The methods used in data collection were daily notes, written tests, and interviews. Data analysis techniques in this research are data reduction, data presentation, drawing conclusions, and verification.

The research resulted in a Hypothetical Learning Trajectory (HLT) for distance material in three dimensions which was compiled using the characteristics of the PMR approach and the phases of the flipped classroom strategy. The steps for teaching the material are as follows: (1) the researcher prepares the teaching materials used, (2) students learn the material through learning videos (asynchronously), (3) students apply the material on the video to solve problems related to distance in three dimensions (online synchronous with the Zoom Meeting media), and (4) students draw conclusions after learning.

Problem solving skills is a person's ability to try to find a way out of a problem, by identifying the things needed, compiling a model, selecting and developing a solution strategy, as well as explaining and checking the answers obtained. Aspects of problem-solving abilities in this study are understanding the problem; create a problem-solving plan; implement a problem-solving plan; and look (check) back. From the test results for the trial class, it was found that (1) in problem 1, 92% of students achieved one indicator, namely understanding the problem; (2) in problem 2, as many as 15% of students achieved

four indicators, as many as 74% of students achieved one indicator, namely understanding the problem; (3) in problem 3, as many as 7% of students achieve four indicators, as many as 74% of students achieve one indicator, namely understanding the problem. From the test results for the research class, it was found that (1) in problem 1, as many as 3% of students achieved two indicators, namely understanding the problem and making problem-solving plans, as many as 89% of students achieved one indicator, namely understanding the problem; (2) in problem 2, 21% of students achieved four indicators, 75% of students achieved one indicator, namely understanding the problem; (3) in problem 3, as many as 14% of students achieved four indicators, as many as 7% of students achieved two indicators, namely understanding the problem and making problem-solving plans, as many as 64% of students achieving one indicator, namely understanding the problem.

Representation skills is a person's ability to express an idea in a certain form, either in the form of tables, symbols, notations, graphs, or to be able to make conclusions in his own language both formally and informally. The aspect of representational ability used in this research is visual representation; representation of a mathematical equation or expression; and representations of words or written text. From the test results for the trial class, it was found that (1) in problem 1, 92% of students achieved one indicator, namely visual representation; (2) in problem 2, 15% of students achieved three indicators, 74% of students achieved one indicator, namely visual representation; (3) in problem 3, as many as 7% of students achieve three indicators, as many as 74% of students achieve one indicator, namely visual representation. From the test results for the research class, it was found that (1) in problem 1, as many as 3% of students achieved two indictors, namely visual representation and representation of equations or mathematical expressions, as many as 89% of students achieved one indicator, namely visual representation; (2) in problem 2, 21% of students achieved three indicators, 75% of students achieved one indicator, namely visual representation; (3) in problem 3, as many as 14% of students achieved three indicators, as many as 7% of students achieved two indicators, namely visual representation and representation of equations or mathematical expressions, as many as 64% of students achieved one indicators, namely visual representation.

Keywords: *Realistic Mathematics Education, flipped classroom, problem solving skills, representation skills, and design research*