MENGONSTRUKSI KEMATANGAN MATEMATIS MAHASISWA UNTUK MENDUKUNG KEMAMPUAN BERPIKIR KOMPUTASIONAL DALAM PEMECAHAN MASALAH KOMPUTASI

(Studi Fenomenologi dan *Grounded Theory* pada Mahasiswa Program Studi Pendidikan Ilmu Komputer)

DISERTASI

Diajukan untuk memenuhi sebagian dari syarat untuk memperoleh gelar Doktor

Bidang Pendidikan Matematika

Disusun oleh:

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PROGRAM STUDI PENDIDIKAN MATEMATIKA

FAKULTAS PENDIDIKAN MATEMATIKA DAN ILMU PENGETAHUAN ALAM

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ABSTRAK

Harsa Wara Prabawa (1910079). Mengonstruksi Kematangan Matematis Mahasiswa untuk Mendukung Kemampuan Berpikir Komputasional dalam Pemecahan Masalah Komputasi

Berpikir komputasional (CT) merupakan salah satu kunci untuk memenuhi tuntutan perkembangan teknologi informasi dan komunikasi, karena memungkinkan individu untuk dapat lebih memahami dan memanfaatkan teknologi secara efektif. Dalam tinjauan pembelajaran matematika di perguruan tinggi, kerap keberadaan CT memerlukan dukungan dan keterlibatan kematangan matematis dalam menyelesaikan masalah komputasi. Beberapa penelitian lainnya menunjukkan kecenderungan yang selaras, dimana kemampuan dalam menyelesaikan masalah komputasi berkorelasi positif dengan pemahaman matematika. Namun, beberapa penelitian mengungkap kecenderungan sebaliknya, di mana keduanya tidak berkembang ke arah yang sama. Penelitian ini berusaha menganalisis kecenderungan hubungan antara kedua keterampilan tersebut dalam pemecahan masalah komputasi. Penelitian ini merupakan penelitian kualitatif dengan metode fenomenologi dan metode *grounded theory*. Kedua metode ini dipilih dengan pertimbangan bahwa keduanya menawarkan wawasan yang berbeda, masing-masing disesuaikan dengan konteks subjek yang berbeda. Fenomenologi memungkinkan pemahaman mendalam tentang pengalaman dosen terkait kematangan matematis, sementara *grounded theory* memberikan peluang untuk mengembangkan teori baru dari pengalaman mahasiswa terkait interaksi antara kemampuan berpikir komputasional dan kematangan matematis dalam pemecahan masalah komputasi. Penelitian ini melibatkan 12 orang dosen yang berasal dari 9 perguruan tinggi dengan bidang pengajaran matematika atau yang melibatkan matematika pada program studi Ilmu Komputer dan mahasiswa Pendidikan Ilmu Komputer semester 4 berjumlah 10 orang. Data dikumpulkan melalui angket, wawancara semi terstruktur dan tes. Temuan penelitian menunjukkan bahwa terdapat hubungan antara kematangan matematis dan kemampuan CT mahasiswa dalam pemecahan masalah komputasi. Respons mahasiswa terhadap masalah yang diberikan bervariasi, sebagian menunjukkan kecakapan yang tinggi dalam berpikir abstrak dan algoritmik, sementara yang lain mendapati kesulitan dalam menerapkan prinsip-prinsip matematis pada masalah komputasi. Dalam interaksinya, kematangan matematis dan kemampuan berpikir komputasional, terbagi ke dalam 3 tingkatan, yaitu domain, transisi dan *programming*. Dalam menyelesaikan masalah komputasi, mahasiswa dengan tingkatan domain cenderung menunjukkan interaksi yang lemah antara penguasaan konsep matematika dan keterampilan komputasi atau sebaliknya. Mahasiswa dalam tingkatan transisi cenderung menunjukkan kematangan matematis yang kuat, dan transisi ke pemrograman yang perlu dikembangkan. Sementara, mahasiswa dalam tingkatan *programming* menunjukkan kuatnya hubungan kematangan matematis dan transisinya dalam pemograman.

Kata Kunci: Kematangan Matematis, Kemampuan Berpikir Komputational, Pemecahan Masalah Komputasi

ABSTRACT

Harsa Wara Prabawa (1910079). ***Constructing Students' Mathematical Maturity to Support Computational Thinking Ability in Computational Problem Solving***

Computational thinking (CT) was being one of the keys to meeting the demands of information and communication technology development, as it was enabling individuals to better understand and utilize technology effectively. In the review of mathematics learning in higher education, the presence of CT often required the support and involvement of mathematical maturity in solving computational problems. Several other studies showed a consistent trend, where the ability to solve computational problems positively correlated with mathematical understanding. However, some studies revealed the opposite trend, where the two did not develop in the same direction. This research aimed to analyze the trend of the relationship between these two skills in computational problem-solving. This research was qualitative, employing a phenomenological method and a grounded theory method. Both methods were chosen with the consideration that they offered different insights, each adapted to different subject contexts. Phenomenology allowed for a deep understanding of lecturers' experiences related to mathematical maturity, while grounded theory provided an opportunity to develop new theories from students' experiences related to the interaction between computational thinking ability and mathematical maturity in computational problem-solving. This research involved 12 lecturers from 9 universities with mathematics teaching fields or those involving mathematics in Computer Science study programs and 10 fourth-semester Computer Science Education students. Data were collected through questionnaires, semi-structured interviews, and tests. The research findings indicate that there is a relationship between mathematical maturity and students' CT ability in computational problem-solving. Students' responses to the given problems vary, with some showing high proficiency in abstract and algorithmic thinking, while others find it difficult to apply mathematical principles to computational problems. In their interaction, mathematical maturity and computational thinking ability are divided into three levels: domain, transition, and programming. In solving computational problems, students at the domain level tend to show a weak interaction between mastery of mathematical concepts and computational skills or vice versa. Students at the transition level tend to exhibit strong mathematical maturity, along with a transition to programming that needs to be developed. Meanwhile, students at the programming level demonstrate a strong relationship between mathematical maturity and its transition in programming.

Keyword: *Mathematical Maturity, Computational Thinking, Computational Problem Solving*

DAFTAR ISI

DAFTAR TABEL

DAFTAR GAMBAR

DAFTAR SINGKATAN

D1_IR	Dosen_1 *Interview Result*
D2_IR	Dosen_2 *Interview Result*
D1_QR	Dosen_1 *Questionnaire Result*
D2_QR	Dosen_2 *Questionnaire Result*

(dan seterusnya hingga D12_QR)

MIK	Dosen dengan latar belakang pendidikan matematika tetapi mengajar di perguruan tinggi dengan bidang ilmu komputer
MCT	Dosen dengan latar belakang pendidikan matematika dan terlibat dalam kegiatan dan penelitian berkenaan dengan *Computational Thinking*
KIK	Dosen dalam bidang ilmu komputer, tetapi bidang pengajarannya berkaitan dengan keilmuan matematika
MA_01	Mahasiswa pertama dengan latar belakang pendidikan SMA
MA_02	Mahasiswa kedua dengan latar belakang pendidikan SMA

(dan seterusnya hingga MA_05)

MK_01	Mahasiswa pertama dengan latar belakang pendidikan SMK
MK_02	Mahasiswa kedua dengan latar belakang pendidikan SMK

(dan seterusnya hingga MK_05)

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