

## ACKNOWLEDGMENT

All praises and gratitude to God that I worship in the name of Jesus Christ our Lord and Savior who has given grace and gifts, so that the author can complete the thesis entitled “Biology Education Pre-Service Teacher Perception and Understanding on Technological Pedagogical and Content Knowledge (TPACK) Framework”. This thesis was prepared to fulfill some of the requirements needed to achieve a Bachelor of Education degree in the Bilingual Biology Education study program, Faculty of Mathematics and Natural Science, Universitas Negeri Medan.

The author realizes that the preparation of this thesis could not be completed without the support of various parties, either directly or indirectly. Through this opportunity, the author would like to express gratitude to all those who have helped in the preparation of this thesis. Special thanks Prof. Dr. Herbert Sipahutar, M.S., M. Sc as a thesis supervisor, for the extraordinary guidance, motivation, and direction so that all stages in the preparation of this thesis can be passed well. Thanks to Dr. Diky Setya Dingingrat, M.Si., as academic supervisor, that has guided the author in her study. To Prof. Dr. rer. nat. Binari Manurung, M.Si., to Mrs. Dra. Martina Asiati Napitupul, M.Sc., and to Mrs. Dr. Widya Arwita, M.Pd., as examiners who have given many criticisms and suggestions for improvement, so that this thesis can be completed properly.

The completion of this thesis also made possible by the ease of administrative process in the department thanks to Mrs. Dr. Ely Djulia, M.Pd., as the chair of the Bilingual Program Coordinator and to Mrs. Khairiza Lubis, S.Si., M.Sc., Ph.D., as the chair of the Biology Department, Faculty of Mathematics and Natural Sciences, Universitas Negeri Medan. My enormous appreciation to Mrs. Dr. Ely Djulia, M.Pd., as expert validators for willingness and help to validate the worksheets. Last but not least to the Student of Biology Education 2022, who are willing to be participants in this research.

Not forget special thanks to beloved family who have support and motivate, praying for the author, so that the author remains enthusiastic about completing this thesis well. To his father Pak Tompul, who never stopped believing in the author

until the end of his days, who gave and taught the author everything, and despite his condition, made sure the author could always pursue his education. To the author's mother Bu Ida, who never gave up on the author, carrying him through all the despair and depression during the process of completing this thesis. To the author's sisters, kak Yeyen, kak Enes, kak Pipit, who always give the author all the support that the author needs during any time of the day. In general, the author also would like to thank to all his friends, bestfriends, partners and specifically Dian Anggraini, for all of the support, encouragement and assistance during the days of the author. With all humility, thanks again to all parties who have helped the author in completing this research.

The author realizes that this thesis still has shortcomings and limitations. Therefore, the authors expect constructive suggestions and criticisms on this thesis. The author hopes that this thesis can provide benefits in the field of education for better education.

Medan, 16 July 2024

Author,

A handwritten signature in black ink, appearing to read 'Rio Madani Putra Pascasah Sitompul', with a stylized flourish at the end.

Rio Madani Putra Pascasah Sitompul