

Development of Basic Mathematics Modules Based on Professional Competencies

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Abstract

The low ability to understand mathematical concepts affects the learning outcomes of information systems study program students in basic mathematics courses. This is because basic mathematics courses tend to be disliked by the YPTK information systems study program students at Putra Indonesia University in Padang. After all, they consider basic mathematics courses do not significantly contribute to their field of expertise. Students prefer courses that suit their area of expertise. Basic mathematics is an abstract subject and is a difficult subject. Students have difficulty applying mathematical concepts to solve problems. The learning module is a basic mathematics module based on professional competence. This basic mathematics module connects basic mathematics subject matter with subject matter in the field of expertise, namely information systems. This research aims to produce a basic mathematics module based on professional competence in the information systems study program at Putra Indonesia University YPTK Padang. This type of research is development research(R&D). The stages in developing this basic mathematics module are the development stages proposed by Plomp. This research carried out a preliminary research stage. Experts carry out product validation. Our instrument is a validation sheet with a Likert scale. The results of the expert validation analysis from aspects of presentation/dictates, suitability of content, language, and graphics obtained an average of 3.39 with a very valid category, which means that the basic mathematics module based on professional competence is suitable for use in basic subjects. Mathematics learning.

Keywords

Module; Basic Mathematic; Professional Competence; Information Systems

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1. INTRODUCTION

Mathematics is taught from the low-education unit level to the higher-education unit level(Kamarullah, 2017). Mathematics fosters a practical mindset, solves problems critically, and supports understanding concepts in other studies((Nurulaeni, F & Rahma, A. 2022). Learning mathematics is an effective strategy for overcoming backwardness in information technology(Ogbu, S., & Ugwu, F.C., 2023). Mathematics material is included in the learning material in the higher education curriculum(Guidebook-Preparation-of-Higher-Education-CurriculumMbkm.Pdf, 2020). Higher



education students study mathematics, including basic mathematics (Yahya, Y, 2005). Basic mathematics is needed to strengthen mathematical understanding and concepts (Bird, J, 2004).

Based on the researcher's initial observations of students through interviews, it was discovered that most students in the Information Systems Study Program did not like basic mathematics courses and preferred basic mathematics courses, as well as red skills courses with a background in information technology. This (Nissa, C. I & Nufida, A. 2022) that students who are not majoring in mathematics do not like mathematics courses because they think that mathematics courses do not significantly contribute to the department they are studying. Students only like the specialty lessons of their study program (D. Kurniawan et al., 2020). Students also feel that mathematics is a difficult and boring subject (Utari, DR, Wardana, MYS, & Damayani, 2019). This is also in line with what was expressed by (Refianti, R., & Luthfiana, M. 2023), that mathematics is a difficult subject and difficult to understand. Difficulties in mathematics occur because mathematics is an abstract subject. & Amalia., 2020), so it often makes students have difficulty understanding it (Sohilait, E. 2021). Likewise, in basic mathematics courses, students experience several difficulties, including difficulty applying concepts correctly (Nurhikmayati, L. 2017).

Learning modules are tools educators use to improve the quality of their learning (Mashuri., S, 2019) to achieve better learning goals (Yunita, 2020). The ability to understand mathematical concepts is one of the abilities that must be trained (Dewimarni, S, 2017) because training the ability to understand mathematical concepts can improve students' mathematics learning outcomes (Supriadi, N., Putra, R, W, Y., & Fitriani, 2022). Learning outcomes are the goal of successful understanding of the concepts being taught (Novianti, N., & Pratama, FW 2022). Understanding mathematical concepts is important in mathematics learning because it can make it easier for students to solve mathematical problems (Sidik, G., & Sudiana, 2023).

Competence in the Big Indonesian Dictionary (*KBBI*) is defined as the ability to master the grammar of a language abstractly or internally, and a profession in the *KBBI* is defined as a field of work based on certain expertise (skills, vocation, and so on). This is in line with what A. et al.) state: professional competence is performance (the ability to do) that collaborates positively with background knowledge, attitudes, and skills. In this research, professional competence is the skill or ability to master an expertise based on or influenced by educational background.

Information technology and education are two things that can be collaborated well with a combination of topics that can be identified. "By further exploring the annual trend of topic proportions and topic correlations, potential future research directions and research areas between topics can be identified" (Xieling Chen et al. in the basic mathematics module with material on limits, derivatives, and functions related to information technology skills competencies such as database storage time, internet networks, and internet speed (Badri, H. et al.. At the beginning of the lesson, problems related to skill competencies are presented, the solution of which is directed at using mathematical concepts. In the next lesson, students are given mathematics practice questions that are not linked to skill competencies to maintain an understanding of mathematical concepts. (Armiati, 2018). Finally, students are again given questions about their expertise and mathematical calculation questions (Armiati, A., & La'ia, 2020).

Developing a Basic Mathematics Module Based on Professional Competencies in the Information Systems Study Program at Putra Indonesia University YPTK Padang is important in improving students' understanding of mathematical concepts. Several aspects need to be considered in developing this module to ensure its success. First, conformity with mathematical concepts is crucial. Modules must be designed to cover basic mathematical concepts that suit the needs of Information Systems Study Program students. This includes the concepts of algebra, trigonometry, statistics, probability, and their application in information technology. Modules should provide clear and relevant explanations to ensure good understanding. Second, module development must pay attention to the curriculum used by the Information Systems Study Program. Modules must be arranged by the outline of the material

in the curriculum, and the learning objectives must be paid attention to. Thus, modules can be an effective tool to support the achievement of the competencies desired by the curriculum. Furthermore, the suitability of the content and material is an important aspect that must be considered in module development. The material in the module must meet academic eligibility standards and be relevant to student learning needs. Material must be presented systematically and structured, with complete and relevant explanations. This will help students to understand mathematical concepts well. Apart from that, language suitability must also be a focus in module development. The language used in the module must be appropriate to the student's level of understanding and avoid the use of confusing terms or phrases. Clear and easy-to-understand language will help facilitate the learning process and ensure the material is accessible to as many students as possible. Finally, the appropriateness of the graphics or appearance of the module is also important to pay attention to. Good visual design and appropriate use of graphics can increase the attractiveness of the module and help readers understand the information better. Modules must be designed with an attractive layout, using images, tables, and diagrams effectively to support understanding of the material. By paying attention to the aspects above, developing a Basic Mathematics Module Based on Professional Competencies in the Information Systems Study Program at Putra Indonesia University YPTK Padang can effectively improve students' ability to understand mathematical concepts. This module will provide equitable and effective access to learning materials that suit student needs and ensure that learning takes place effectively and efficiently.

Based on the description above, it is necessary to develop a Basic Mathematics Module Based on Professional Competencies in the Information Systems Study Program at Putra Indonesia University YPTK Padang to improve the ability to understand mathematical concepts by paying attention to suitability with mathematical concepts, curriculum, suitability of content, suitability of material, suitability of language, and suitability graphic.

2. METHODS

The type of research used is Research and Development (R&D). The development model used in this research is the Plomp model developed by (Plomp T. 2013). This model is used because the development steps are simpler and easier to understand (Arianatasari, a., & Hakim, I., 2018). The Plomp development stages consist of 3 stages: (1) Preliminary research, (2) Prototyping stage (3) Assessment stage. The instrument researchers use a validation sheet that has been declared valid and can be used to see the suitability between the content and the objectives of what you want to measure. (Hendryadi, 2017). The Plomp development stages consist of three main stages: preliminary research, prototyping, and assessment. Each stage plays an important role in ensuring the successful development of quality products or services. The instrument used in this research is a validation sheet tested and declared valid to measure the suitability between the module content and the objectives to be achieved. 1) Preliminary Research: at this stage, researchers collect data and initial analysis to understand the needs and characteristics of the audience and the environment in which the product or service will be used. This includes identifying learning objectives and materials and developing effective presentation methods. Preliminary research includes a literature review to understand previous research and best practices in developing similar products. 2) Prototyping Stage: after completing preliminary research, the next stage is making a product or service prototype. This stage involves preparing learning materials, visual design, and setting the overall format. This prototype is designed to provide an initial idea of how a product or service will look and function. This prototype will then be checked, evaluated, and adjusted according to the feedback received. 3) Assessment Stage: in this stage, the product that has been created will be evaluated to measure quality, effectiveness, and suitability to the initial objectives. Assessment instruments, such as validation sheets, check the conformity between the module content and

previously established learning objectives. Evaluation may also include field tests or case studies to test students' understanding of the material presented in the module. The validation sheet instrument is an important tool in evaluating the success of the basic mathematics module. This validation sheet helps ensure that the module content meets the learning objectives previously set. Careful and systematic assessment at this stage allows researchers to identify deficiencies or need further adjustments before the final product is introduced to the target audience.

3. FINDINGS AND DISCUSSIONS

Results

Preliminary Stage

The product in this research was developed through a preliminary stage, followed by the initial problem analysis needs analysis and literature study. The result of this stage is the initial design of a prototype of the Basic Mathematics Module Based on Professional Competencies in the YPTK Information Systems Study Program, Putra Indonesia University, Padang and the product was validated by three experts, namely Indonesian Language Expert Mrs. Desi Afrianti, S.Hum, M.Hum, Mathematics Expert Mrs. Mishbah Ulhusna, S.Si, M.Si and Information Technology Expert Mrs. Dr. Rini Sovia, S.Kom, M.Kom.

In the initial analysis stage, researchers carried out activities based on interviews and the low basic mathematics learning outcomes as well as the need for a professional competency-based basic mathematics learning media information systems study program to improve students' ability to understand mathematical concepts which will have an impact on improving students' basic mathematics learning outcomes. In this Basic Mathematics Module, the material is about Limit Functions, Derivatives, and Integrals. This material was developed using the existing curriculum at the YPTK Information Systems Study Program at Putra Indonesia University in Padang, which uses the Outcome Based Education (OBE) curriculum. Curriculum analysis regarding the relationship between basic mathematics material and skills courses in the information systems study program can be seen in Table 1.

Table 1. Analysis of the Basic Mathematics Curriculum and Specialization Subjects

Material	Special Courses	SKS	Semester
Limit Function	Cloud computing: Data storage capacity limitations are part of the discussion regarding cloud computing and cloud storage services	3	4
Derivatives	Network and Data Communications: Internet speed is one of the important parameters that includes network protocols, architecture, and performance.	3	7
Integral	Operating system: at the operating system level, input/output (I/O) processing and data flow management	2	5

The learning media in the form of a Basic Mathematics Module Based on Professional Competence, courses in the Information Systems Study Program at Putra Indonesia University YPTK Padang are designed by looking at the relationship between the material in the Basic Mathematics courses and skills courses in the Information Systems Study Program.

At the needs analysis stage, literature studies were carried out with an analysis of learning media needs for the Basic Mathematics Module Based on Professional Competence in the Information Systems Study Program course at Putra Indonesia University YPTK Padang requiring an in-depth understanding of student needs, characteristics, learning materials, and teaching objectives. Following

are some of the needs analysis results that researchers found, including considering student characteristics, such as previous educational background, level of mathematical ability, learning preferences, and special needs (if any). Information Systems Study Program students have diverse interests in mathematics, so modules need to be designed to meet these diverse needs. The module developed includes basic mathematical material that is relevant to the needs of students in the Information Systems Study Program, including basic concepts such as algebra, trigonometry, statistics, and probability, as well as their application in the context of information technology, looking at the learning objectives to be achieved through the use of the module. This. These goals include understanding mathematical concepts, the ability to apply concepts in a computing context, and developing problem solving skills. On the other hand, there is a need for technology and accessibility. As students of the Information Systems Study Program, most students have access to technology. Therefore, modules can be designed using technology such as online learning platforms, learning videos, or interactive mathematics software. This module is designed to provide students with an interesting and relevant learning experience. This may include case studies, real-world application examples, and problem-based learning activities.

Product Creation Stage

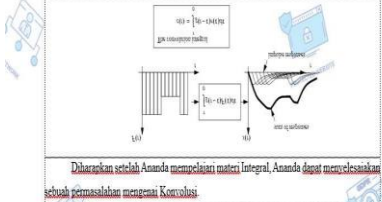
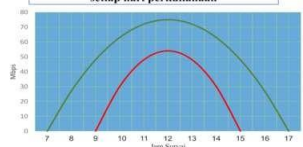
In the initial stages of designing a basic mathematics teaching module based on professional competencies, there are several characteristics, namely: Competency Page, Competency Page contains material and its relation to professional competence or professional expertise in Information Systems, this material is linked to terms in the field of Information Technology and examples cases in the field of Information Technology. Material Source contains basic Mathematics materials presented in accordance with the Curriculum in the information systems study program to improve students' understanding of mathematical concepts. The Question Block contains mathematical questions to hone theoretical understanding of mathematical concepts. Competency Training Questions: Competency training questions contain training questions related to skills or professional competencies in information technology.

Products in the form of basic mathematics modules are validated constructively by experts or experts as a first step to see the suitability of the content with existing concepts. (Marnat Growth, 2010) The expert or validation expert in this research is an Indonesian language expert who validates basic mathematics modules from a linguistic perspective, such as writing symbols, punctuation, and spelling. Second, mathematicians carry out validation in terms of the suitability of the content and presentation of basic mathematics teaching modules. Third, information technology experts validate the relationship between expertise material and professional competency graphics with basic mathematics.

The results of the revision of the validation of the Basic Mathematics Module Based on Professional Competencies, YPTK Information Systems Study Program, Putra Indonesia University, Padang, can be seen in Table 2.

Table 2. Revision of Basic Mathematics Module Products Based on Professional Competencies

No.	Before Revision	After Revision
1.	 <p>https://www.freepik.com/</p>	 <p>https://www.freepik.com/</p>

No.	Before Revision	After Revision
2.	<p>Isi bagian wifii maupun GSM menggunakan sinyal yang bentuknya analog. Proses perubahan ini biasanya dilaksanakan dengan Modulasi Demam sinyal yang memiliki informasi dikirirkan dengan sinyal pembawanya. Dalam sinyal digital perubahan ini dilakukan secara matematis yang bernama Konvolusi.</p> <p>Defenisi: Konvolusi f dan g ditulis $(f * g)$, yang menyatakan operator dengan simbol $*$. Didefinisikan sebagai integral hasil kali dua fungsi setelah salah satunya dicerminkan terhadap sumbu y dan digeser. Dengan demikian, ini adalah jenis Transformasi Integral Tertentu:</p> $(f * g)(t) = \int_{-\infty}^{\infty} g(t - \tau)f(\tau) d\tau$  <p>Diharapkan setelah Anda mempelajari materi Integral, Anda dapat menyelesaikan sebuah permasalahan mengenai Konvolusi.</p>	<p>Competency Page</p> <p> Grafik rata-rata Penggunaan Internet Kampus setiap hari perkuliahannya</p>  <p>Survey penggunaan jaringan wifii di sebuah kampus dalam satu minggu dari jam 7:00 hingga jam 17:00 diperoleh rata-rata penggunaan bandwidth total setiap harinya sebesar $-8x^2 + 72x - 357$ terhadap jam aktifitas kampus yang ditunjukkan pada gambar dengan bentuk bujur. Sebagian penggunaan bandwidth untuk sosial media dan video yang dimanfaatkan pada kurva tersebut dengan persamaan $-6x^2 + 144x - 810$ dan sisanya digunakan untuk browsing. Dari kurva rata-rata penggunaan internet tersebut, tentukanlah berapa total bandwidth yang digunakan setiap harinya, dan tentukan berapa total bandwidth yang digunakan untuk browsing.</p> <p>Jawab:</p> <p>a. Untuk mencari berapa total bandwidth yang digunakan dalam sehari dapat kita selesaikan dengan menggunakan skema mencari luas antara kurva bandwidth total dan sumbu x dengan menggunakan integral tentu dengan jam sebagai batasnya. Sehingga:</p> $\int_0^{17} (-8x^2 + 72x - 357) dx = \left(-\frac{8}{3}x^3\right) + \left(\frac{72}{2}x^2\right) - 357x$ $= -(17^3 - 7^3) + 36(17^2 - 7^2) - 357(17 - 7)$
3.	<p>Contoh 5.19.</p> <p>Hitung $\int x\sqrt{x-4} dx$</p> <p>Jawab:</p> <p>Misalkan $u = \int x\sqrt{x-4} dx \rightarrow u^3 = x-4 = x-4$ dan $3u^2 du = dx$</p> <p>Sehingga:</p> $\int x\sqrt{x-4} dx = \int (u^3 + 4)u \cdot 3u^2 du$ $= \frac{3}{7}(x-4)^{7/3} + (x-4)^{4/3} + c$	<p>Contoh 5.19.</p> <p>Hitung $\int x\sqrt{x-4} dx$</p> <p>Jawab:</p> <p>Misalkan $u = \int x\sqrt{x-4} dx \rightarrow u^3 = x-4 = x-4 = (x-4)^{1/3}$ dan $3u^2 du = dx$</p> <p>Sehingga:</p> $\int x\sqrt{x-4} dx = \int (u^3 + 4)u \cdot 3u^2 du$ $= \int 3u^6 du + \int 12u^5 du$ $= \frac{3u^7}{7} + \frac{12u^6}{6} + C$ $= \frac{3}{7}(u-4)^{7/3} + 3((u-4)^{1/3})^6 + C$ $= \frac{3}{7}(u-4)^{7/3} + 3(u-4)^{6/3} + C$

Validation Assessment Results

The results of the product validation of the Professional Competency Based Basic Mathematics Module with experts or language experts, namely Mrs. Desi Afrianti, S.Hum, and M.Hum, are the standard spellings used by the KBBI such as theory becomes theoretical, the definition becomes definition, and punctuation is used for commands such as calculate and determine the use of exclamation marks (!). The second expert or expert, namely Mrs. Mishbah Ulhusna, S.Si, M.Si, said that in the graph or picture, there is information from the picture for writing all mathematical formulas according to the equations, formulas, and solutions. They added detailed steps to the solution. The third expert or expert is Mrs. Dr. Rini Sovia, S.Kom, M.Kom. The example questions are detailed according to the areas of expertise in the Information Systems program, such as streaming applications. Then, the streaming applications are explained clearly. The Competency Page is detailed according to the areas of expertise in the Information Systems Study Program.

Aspects that experts have validated are contained in the validation questionnaire research instrument. The results of the validation questionnaire analysis (Riduwan, 2010) can be seen in Table 3.

Table 3. Product Validation Analysis Results

No.	Rated aspect	Average	Category
1	Presentation/Didactic	3.63	Highly Valid (SV)
2	Content Eligibility	3.60	Very Valid (V)
3	Language	3.75	Highly Valid (SV)
4	Graphics/Display	3.33	Valid (V)
	Average Amount	3.39	Highly Valid (SV)

The expert validation questionnaire analysis results show that the Basic Mathematics Module Based on Professional Competencies in the YPTK Information Systems Study Program, Putra Indonesia University, Padang, received an average rating of 3.39 in the very valid category. This shows that the module has been considered very valid by experts regarding presentation/didactics, appropriateness of content, language, and graphics/appearance. Thus, this module is considered suitable for use with minor revisions. First, the presentation/didactic aspect refers to how the material in the module is presented to the reader and how much it facilitates the learning process. High ratings from experts in this aspect show that the module provides clear and easy-to-understand explanations and uses effective learning methods. This ensures that students can understand and absorb the material well. Second, content appropriateness refers to the adequacy, accuracy, and relevance of the information presented in the module. High ratings from experts indicate that this module covers the material necessary to meet the course's learning objectives. The material presented is also relevant to the Information Systems Study Program context, ensuring that students can apply mathematical concepts in the context of information technology. Third, the language used in the module is considered appropriate to the student's level of understanding and avoids the use of confusing terms or phrases. This is important to ensure that the modules are accessible and understandable to as many students as possible without unnecessary language barriers. Lastly, the graphics/appearance of the module also received high marks from experts. Good visual design and appropriate use of graphics can increase the attractiveness of the module and help readers understand the information better. Thus, this module is considered to have an attractive appearance and is easy to navigate. Although the module has been deemed very valid and suitable, some revisions must be made. This revision ensures that the module reaches the highest standards and provides an optimal learning experience for Information Systems Study Program students.

Discussion

Professional Competency Based Basic Mathematics Module that has gone through an expert validation process and is considered suitable for use in learning. It is important to understand that this module is not just a collection of material but is also an important tool in providing equitable and effective access to the basic mathematical knowledge required for students of the Information Systems Study Program at Putra Indonesia University, Padang. The importance of the Basic Mathematics Module Based on Professional Competencies can be seen from various aspects: a) It is suitable for student needs, and Information Systems Study Program students have special learning needs. They need a strong understanding of basic mathematics to master more complex concepts in information technology. This module is designed to meet these needs by presenting basic mathematics material in a way that is relevant and easy to understand. b) High Learning Quality: The expert validation process guarantees high module quality. By involving experts in various related fields, this module can ensure that the material presented is accurate, relevant, and useful for students. This creates a supportive learning environment for students to understand basic mathematical concepts deeply. c) Valuable Learning Resources: this module is not only additional teaching material but also a valuable learning resource for students. By presenting material in a structured and systematic manner, the module provides students with easy access to self-study, deepening understanding and overcoming difficulties in understanding basic mathematical concepts. d) Supports Independent Learning: This Basic Mathematics module supports an independent learning approach, where students can learn at their own pace and in their learning style. This module provides complete material with clear explanations, examples, and exercises that help students gain in-depth understanding. e) Relevance to the Field of Study: Because this module was developed specifically for students in the Information Systems Study Program, the material presented is relevant to the student's field of study. This helps students see the connection between basic mathematical concepts and practical applications in information technology. f) Overcoming Learning Difficulties: this module can also be an effective tool for overcoming learning difficulties experienced by some students. This module helps students overcome obstacles in

understanding basic mathematical concepts by providing comprehensive explanations and varied exercises. g) Encouraging Critical Thinking and Problem-Solving, the material presented in the module emphasizes understanding concepts and the application of concepts in problem solving. It helps students develop critical thinking abilities and problem-solving skills that are important in information technology. Thus, this Professional Competency-Based Basic Mathematics Module is not just an additional learning resource but is also an integral part of the student learning experience in the Information Systems Study Program. With high quality and good suitability to student needs, this module is expected to increase learning effectiveness and help students achieve optimal learning outcomes.

4. CONCLUSION

The validation data obtained an average value of 3.39 with a very valid category, which means that the Basic Mathematics Module Based on Professional Competencies in the Information Systems Study Program at Putra Indonesia University YPTK Padang is suitable for use. Experts carry out product validation. The aspects validated are presentation/didactic, content appropriateness, linguistic, and graphic aspects. Product validation is carried out by experts, including linguists, mathematicians, and experts in information technology. The research instrument is a validation sheet using a Likert scale. Hopefully, this research can be continued to the next stage, namely the Prototyping stage and the Assessment stage, and can become a learning medium for basic mathematics courses, especially in the Information Systems study program for lecturers and students at other universities.

REFERENCES

- Arianatasari, A., & H. (2018). Application of Plomp Model Design in Guided Inquiry-Based Textbook Development. *Journal of Accounting Education (JPAK)*, (1), 6. <https://ejournal.unesa.ac.id/index.php/jpak/article/view/24947>
- Armiaati, A., & La'ia, H. (2020). The Impact of Professional Competency-Based Mathematics Learning Tools on Students' Problem Solving Skills in Information and Communication Technology Expertise. *Journal Eksakta Education (JEP)*, 4(1), 57-65.
- Armiaati, A. (2018). Mengembangkan Higher Order of Thinking Skill Melalui Pembelajaran Matematika pada Siswa Sekolah Menengah Kejuruan. *Jurnal LEMMA*, 4(2), 7-19.
- (Nurulaeni, F & Rahma, A. 2022 Analysis of the Problematics of Implementing Independent Learning in Mathematics. *Journal of Pacu Basic Education UNU NTB PGSD*, 2(1), 35-45.
- Badri, H., Nemri, N., Zairi, H., Gharsallah, A., Trabelsi, H. (2016). A Planar Coupled-Fed Unidirection Dual-Band Antenna for GSM, UMTS, WLAN, LTE and Wi-MAX Applications. *International Journal on Communications Antenna and Propagation (IRECAP)*, 6(1), 27-32.
- Bird, J. (2004). *Basic Mathematics Theory and Practical Applications. Third Edition. Jakarta: Erlangga.*
- Buku-Panduan-Penyusunan-Kurikulum-Pendidikan-TinggiMbkkm.pdf.* (2020). <https://dikti.kemdikbud.go.id/wpcontent/uploads/2020/10/Buku-Panduan-Penyusunan-Kurikulum-Pendidikan-TinggiMbkkm.pdf>
- D. Kurniawan. et. (2020). Conference Series, International Conference on Mathematics and Mathematics Education. In *Journal of Physics* (Vol. 1554). Universitas Negeri Padang, August 3, 2019, , Padang City, Indonesia.
- Dewimarni, S. (2017). Kemampuan Komunikasi Dan Pemahaman Konsep Aljabar Linier Mahasiswa

- Universitas Putra Indonesia 'YPTK' Padang. *Al-Jabar: Jurnal Pendidikan Matematika*, 8 (1), 53–62.
- Growth Marnat, G. (2010). Handbook of Psychological Assessment. Translation. Soetjipto. *Translation. Soetjipto, H.P & Soetjipto, S.M. Yogyakarta: Student Library.*
- Hendryadi, H. (2017). Content Validity: The Initial Stage of Questionnaire Development. *Journal of Management and Business Research (JRMB), Faculty of Economics, UNIAT*, 2(2), 169-178.
- Kamarullah. (2017). Mathematics Education in Our Schools. Al Khawarizmi. *Journal of Mathematics Education and Learning*, 1(1), 21-32.
- Kamus Besar Bahasa Indonesia (KBBI)*. (n.d.).
- Mashuri., S. (n.d.). *Math Learning Media*. Yogyakarta: Deepublish.
- Nissa, C., I & Nufida, A., B. (2022). Analysis of Basic Mathematics Skills of Chemistry Education Students. *National Seminar on Mathematics Education 2022: Literacy and Numeracy in the Digitalization of Mathematics Learning.*, 46-51. isbn:978-602-5559
- Nurhikmayati, L. (2017). Analysis of Student Learning Difficulties in Basic Mathematics Subjects. THEOREMS. *Journal (The Original Research of Mathematics)*, 2(1), 74-85.
- Ogbu, S., & Ugwu, F. C. (2023). Development and validation of mathematics persistence scale for secondary school students. *International Electronic Journal of Mathematics Education*, 18(4), em0756. <https://doi.org/10.29333/iejme/13742>. *International Electronic Journal of Mathematics Education*, 18(4).
- Plomp, T. (2013). *Educational Design Research*. SLO-Netherland Intitute for Curriculum development.
- Pratama, N. &. (2022). The Level of Understanding of Student Concepts on Number Pattern Material Based on APOS Theory. Musharraf. *Journal of Mathematics Education*, 11(2), 237-246.
- Rahmayani., V & Amalia., R. (2020). Strategies to Increase Student Motivation in Learning Mathematics in the Classroom. *Journal on Teacher Education*, 2(1), 18-24.
- Rahmi, A., Rosyidah, S., Mukhoyyarah, F. R., Damayanti, I., Salsabila, S., & Istiningsih, I. (n.d.). Teacher Professional Development in Understanding the Character of Elementary School Students. Dawuh Guru. *Journal of MI/ SD Education*, 2(2), 113-126.
- Refianti, R., & Luthfiana, M. (n.d.). Development of Student Worksheets Using the Indonesian Realistic Mathematics Approach on the Material of Linear Equations of Two Variables in Class VIII". *Journal of Mathematics Education: Judika Education*, 6(1), 38-45.
- Riduwan. (2010). *Learning Easy Research for Teachers, Employees, and Beginner Researchers*. Bandung: Alfabeta.
- Sidik, G., & Sudiana, R. (2023). Analysis of Mathematical Comprehension Ability of Class VIII Junior High School Students Based on Pirie-Kieren Theory. *Cendekia Journal: Journal of Mathematics Education*, 7(3), 2405-2419.
- Sohilait, E. (n.d.). *Realistic Mathematics Learning*.
- Supriadi, N., Putra, R, W, Y., & Fitriani, F. (2022). Implementing a realistic mathematics learning approach (RME) and analytical thinking: The impact on students' understanding of mathematical concepts in Indonesia. *Al-Jabar: Mathematics Education*, 13 (2), 465-476.
- Utari, D. R., Wardana, M. Y. S., & Damayani, A. T. (2019). Analysis of Mathematics Learning Difficulties in Solving Story Problems. *Scientific Journal of Elementary Schools*, 3(4), 534–540.
- Xieling Chen, Di Zou, Gary Cheng, H. X. (n.d.). *Elsevier: Computers & Education. Volume 151.*

Yahya, Y. (2005). *Basic Mathematics for Higher Education*. Bogor: Ghalia Indonesia.

Yunita, S. (2020). *ICT-based Mathematics Learning*. Malang: Ahlimedia Book.