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## Design of GASING Digital Module Based on Compassionate Teaching to Understand Multiplication Concepts: A Systematic Literature Review

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### ABSTRACT

Low multiplication comprehension and high math anxiety are major challenges in elementary schools due to the neglect of student's cognitive and emotional aspects. This study examines the effectiveness of integrating the GASING (Easy, Fun, and Enjoyable) Method and a digital module-based Compassionate Teaching approach to improve numeracy skills while reducing emotional barriers. Using a Systematic Literature Review (SLR) design based on PRISMA 2020 standards, a selection was made from 73 articles in Google Scholar, DOAJ, and Garuda. After removing duplicates and screening titles, abstracts, and full texts based on inclusion criteria, 10 primary articles were obtained for analysis. The synthesis results show that the GASING Method significantly improves the multiplication ability of regular students from an average score of 53.6 to 85.4 (N-Gain 69.51%), and is stable in the range of 80%–100% for children with special needs through concrete, abstract, and conjecture stages. This cognitive achievement is further optimized with Compassionate Teaching which is clinically proven to reduce academic stress and optimize the brain's working memory capacity by up to 90%. The integration of both is realized through an interactive e-module with an expert feasibility level above 83% which is tested to be valid and practical. The implication is that digital learning media must be oriented towards cognitive strengthening as well as brain-friendly psychological conditions to reduce academic trauma and encourage independent learning in elementary school students.

## 1. Introduction

Mathematics education in elementary schools (SD) is the primary foundation for developing student's numeracy skills. This education aims to train students to reason logically, evaluatively, structurally, reflectively, and innovatively, while also developing collaborative skills (Attalina & Irfana, 2020). In line with this,

modern learning not only focuses on competitive academic achievement but also emphasizes the importance of building a strong numeracy foundation from an early age. This allows students to develop optimally, actively engage in the learning process, and be ready to contribute to society (Fitriana & Khoiri Ridlwan, 2021). Therefore, a solid understanding of mathematics at the elementary school level is a crucial foundation for subsequent levels of education (Hasibuan, 2024).

One of the basic materials that elementary school students must master is the concept of multiplication. However, understanding this concept often presents a challenge for many students, which then impacts their low motivation and enthusiasm for learning. To address this problem, innovation in media and learning methods is needed. Learning in the modern era requires students to have expertise in technology, media, and information (Sulistiyarini & Sabirin, 2020). In this context, the use of technology and interactive learning approaches is crucial to revitalize student's interest and conceptual understanding (Aminullah & Irwansya, 2024).

The development of digital technology opens up significant opportunities for delivering more adaptive and engaging mathematics learning. Game-based learning and interactive media have been shown to positively contribute to student engagement, motivation, and understanding of abstract concepts, as well as cognitive and affective development (Muhaimin et al., 2025; Oktama et al., 2026). Specifically, interactive digital modules have the potential to support students in independent learning at their own pace. The development of interactive multimedia-based teaching materials has been proven valid and effective in enhancing independent learning (Suarmita et al., 2025). Therefore, teachers are required to be able to design and utilize engaging modules to improve student learning motivation and academic achievement (Bayu et al., 2022).

In addition to learning media, selecting the right method also plays a key role. One innovative approach proven effective in improving basic mathematics understanding is the GASING method (Easy, Fun, and Exciting). This method can improve student's understanding of multiplication concepts while simultaneously motivating them to be active learners in learning (Yuliani et al., 2024). The development of digital modules based on the GASING method has also been widely researched and has shown a high level of validity, practicality, and effectiveness. (Andhany & Maysarah, 2023; Feriyanti et al., 2019).

However, the success of learning depends not only on the sophistication of the module or method used, but also on a humanistic and attentive teaching approach to student's emotional conditions, namely Compassionate Teaching. The ideal learning module planning must consider the characteristics and needs of students through the teacher's adaptive and student-centered pedagogical competencies (Senda et al., 2026). The Compassionate Teaching approach emphasizes the importance of positive interpersonal relationships between teachers and students. (Rohman et al., 2024). Teacher empathy is a determining factor in providing quality emotional support (Aldrup et al., 2022). By integrating Compassionate

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Teaching into the design of GASING based digital modules, emotional barriers such as math anxiety are expected to be overcome.

Based on this background, this systematic literature review was conducted to identify and synthesize findings from previous studies (Soeharso, 2023). This study aims to examine in depth the design of the GASING digital module that adopts the principles of Compassionate Teaching. More specifically, this study integrates and analyzes various findings from previous studies that discuss the effectiveness of the implementation of the GASING Method in improving the multiplication calculation skills of elementary school students, both regular and special needs, the application of empathy-based pedagogy contributes to reducing mathematics anxiety and emotional barriers in the context of elementary mathematics learning, and the integration of the two approaches can be designed into a valid and practical digital module to help student's enthusiasm for learning.

Through this approach, the results of the evaluation and synthesis of the literature are expected to provide a strong theoretical foundation as well as practical guidelines in developing innovative digital modules. This module is expected to not only be able to improve student's cognitive abilities in understanding mathematics, but also significantly strengthen their motivation and enthusiasm for learning at the elementary education level.

## 2. Methodology

This study uses the Systematic Literature Review (SLR) method, a scientific approach carried out in a structured and transparent manner to identify, select, evaluate, and integrate various relevant research results (Iskhakova et al., 2017). This approach allows researchers to obtain a comprehensive overview of the development map of previous studies based on published empirical evidence. Specifically, this SLR aims to synthesize empirical and theoretical findings related to the effectiveness of the GASING Method, the use of digital learning media in elementary schools, and the implementation of Compassionate Teaching.

The entire process of literature synthesis and selection is carried out in accordance with the PRISMA 2020 framework standards (Preferred Reporting Items for Systematic Reviews and Meta-Analyses). The PRISMA 2020 based literature selection process in designing the GASING digital module based on *Compassionate Teaching* for elementary school multiplication concepts is presented in the following figure.

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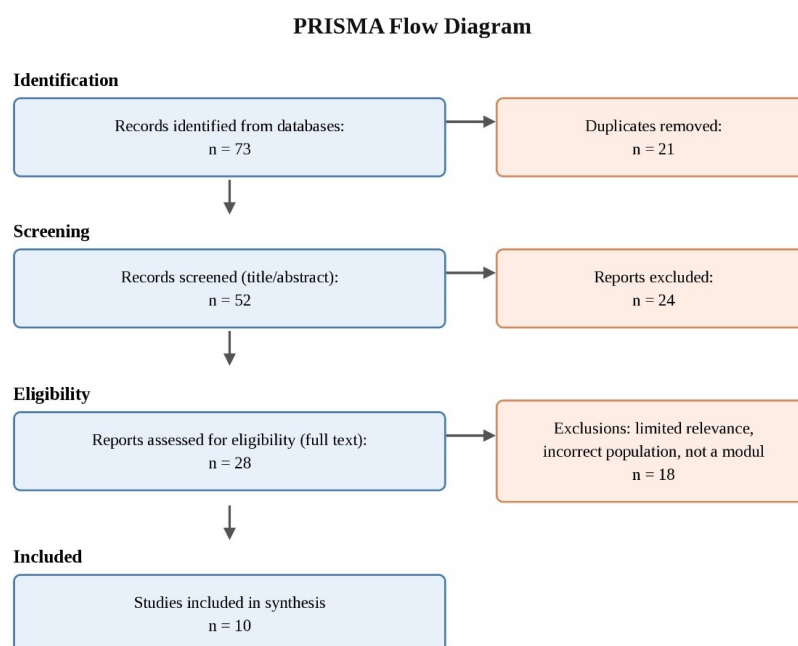


Figure 1. PRISMA 2020 Diagram

This study uses the PRISMA 2020 framework to systematically identify, screen, assess, and select relevant literature (Moher, Douglas G. Altman et al., 2009). In the identification stage, a literature search was conducted through several academic databases, namely Google Scholar, DOAJ (Directory of Open Access Journals), and Garuda (Digital Reference Library), using a combination of keywords "GASING Method," "Primary School Mathematics," "Digital Learning," "Digital Module," "Compassionate Teaching," "Empathy in Learning," and "Systematic Literature Review". Initial inclusion criteria included peer-reviewed scientific articles, published between 2018 and 2025, focused on elementary school mathematics learning, and written in Indonesian or English. This process resulted in 73 articles, which were then narrowed to 65 articles after 21 duplicate records appearing in several databases were removed.

In the screening stage, the titles and abstracts of the remaining 52 articles were examined to assess their relevance to the research focus on the GASING method, digital modules, and empathetic teaching. Articles that were unrelated to mathematics education, conducted at the secondary education level, or lacked a clear research method were excluded from the analysis. The selection process considered thematic relevance, methodological clarity, and publication quality, with priority given to journals indexed by SINTA 1–3, registered in DOAJ, or indexed by Scopus.

This stage resulted in 28 articles being selected, while 24 articles were excluded due to their limited relevance to the research objectives. The eligibility stage involved an in depth review of the full texts of the remaining 28 articles, evaluating the completeness of the research components of the objectives, theoretical framework, methodology, findings, and conclusions. The theoretical

foundation of this review rests on the integration of four main pillars: the Concrete, Abstract, Mental Calculation Stage Theory of the GASING Method (Prof. Yohanes Surya, PhD), the concept of Compassion Based Education, Vygotsky's Social Constructivism Theory, and the Systematic Instructional Design Theory (ADDIE and Borg & Gall models). Articles that did not meet quality standards or did not present complete data were excluded from the analysis at this stage, resulting in 18 articles being excluded. The final inclusion stage resulted in 10 final articles that met all eligibility criteria after a rigorous and objective selection process. These ten articles were included in the final synthesis and mapped into the SLR matrix table to explore the integration of the GASING Method, the empathetic teaching approach, and the development of digital modules in elementary schools.

### **3. Results and Discussion**

#### ***Data analysis***

Study this Systematic Literature Review (SLR) was conducted qualitatively and quantitatively descriptively on ten selected articles published between 2018 and 2025. The analytical approach used was a structured content analysis to synthesize empirical findings and map the relationship between the GASING Method, Compassionate Teaching, and the development of digital modules in elementary schools. The data analysis procedure began with identifying the research focus through data extraction from each article, including author identity, year of publication, research design, instruments, and main results related to the level of validity, practicality, and effectiveness. Next, the data were grouped into three main domains, namely the cognitive domain related to the effectiveness of the GASING Method in understanding multiplication concepts, the affective domain related to the impact of the Compassionate Teaching approach on reducing math anxiety and emotional regulation, and the digital media domain related to the technical feasibility of interactive digital modules.

After clustering is done, quantitative data such as percentage improvement, gain scores, and significance tests are transformed into comparative descriptions to identify general patterns, effectiveness trends, and effect sizes of variables studied. In the synthesis conceptual for analyzing the causal relationship between variables, especially how the support of affective aspects frees up students working memory capacity, thereby supporting the cognitive work of the GASING Method which is accommodated through interactive digital module media.

#### ***Synthesis Findings***

Synthesis findings from ten article prove that optimization learning mathematics at school base achieved through integration three main pillars: method cognitive structured, intervention affective, and adaptive digital media platforms. In the cognitive domain, the GASING method (Maulida et al., 2024; Putri & Anggraini, 2025; Safitri et al., 2025; Yuliani et al., 2024) proven in a way massive increase

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ability multiplication student regular (average increase) from 53.6 to 85.4) and children in need special (80%–100%) through stages mathematics concrete, abstract, and conceited. However, impact cognitive this only work in a way maximum if obstacle psychological in the form of anxiety mathematics muted moreover formerly through approach full teaching empathy (Frazier et al., 2025; Jazaieri, 2018; Rohman et al., 2024) which in clinical proven can free capacity memory work brain child until optimal level of 90% for readiness focus learning. When the GASING content and principles full teaching empathy integrated to in module electronic interactive that has been proven valid and practical with score feasibility above 83 % (Andhany & Maysarah, 2023; Anggristia et al., 2022; Feriyanti et al., 2019) matter that create innovation in the form of friendly digital module brainy and friendly psychological, at the same time eliminate academic trauma and improve learning independent and organized student in a way significant.

### ***Discussion of Analysis Results Findings***

The final result of this process is the acquisition of study articles that meet the terms and conditions included in the analysis study. This is presented in Table 1 below:

Table 1. Analysis Results Findings

| No. | Author & Year                                  | Article Title                                                                                                                                                 | Research Method / Development Model                                                       | Research Results (Validity, Practicality, Effectiveness)                                                                                                                                                                                                                                                                                                      |
|-----|------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.  | Safitri, M., Iriawan, SB, & Mufliva, R. (2025) | The Effectiveness of the GASING Method in Improving Mathematical Procedural Understanding Ability in Multiplication Among Phase B Elementary School Students  | Quantitative pre-experimental research with a single-group pre-test and post-test design. | The results of the study showed an increase in student's procedural understanding abilities after the application of the GASING method with a significance value of $0.001 < 0.05$ . These findings indicate that the GASING method is effective in helping students understand multiplication procedures through concrete, visual, and interactive learning. |
| 2.  | Maulida, SA, Isrokatun, I., & Julia, J. (2024) | The Effect of TGT Cooperative Learning with the GASING Method on the Understanding of Mathematical Concepts of Two-Digit Multiplication in Elementary Schools | Quantitative Quasi-Experimental Design with Unequivalent Control Group.                   | The Mann-Whitney test on post-test scores yielded a Sig value of $0.01 < 0.05$ . The experimental class experienced an increase in scores of 0.56 (much higher than the control class which was only 0.26), proving that TGT combined with GASING significantly influenced student's conceptual understanding.                                                |
| 3.  | Putri, MS, Damri,                              | The Effectiveness of the Gassing                                                                                                                              | Single Subject Research (SSR)                                                             | The child's target ability increased from baseline (A1)                                                                                                                                                                                                                                                                                                       |

| No. | Author & Year                                                              | Article Title                                                                                                                                                                                        | Research Method / Development Model                                                                             | Research Results (Validity, Practicality, Effectiveness)                                                                                                                                                                                                                                                |
|-----|----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|     | Nurhastuti, Tsaputra, A., & Zupiani, M. (2025)                             | Learning Method in Improving Multiplication Operation Skills in Children with Mild Intellectual Disabilities                                                                                         | uses an A1-B-A2 design.                                                                                         | by 20% to 80% during the intervention (B), and remained high at 80%–100% at the final baseline (A2). The 0% data overlap score reinforces the absolute effectiveness of the GASING method.                                                                                                              |
| 4.  | Yuliani, NP, Antari, NWA, Wulandari, PS, et al. (2024)                     | The Effectiveness of Applying the GASING Method in Multiplication of Two-Digit Numbers in Elementary Schools                                                                                         | Library research using documentation data collection techniques and content analysis techniques.                | The results of the analysis of related literature show that the GASING method is very effective in deepening basic multiplication concepts through fun games, reducing anxiety about mathematics, and increasing student activity and academic grades.                                                  |
| 5.  | Rohman, K., Turmudi, Budimansyah, D., Syaodih, E., & Maulidiyah, EC (2024) | Instilling Empathy in Mathematics Learning in Elementary Schools                                                                                                                                     | Qualitative Descriptive Research (Qualitative Research / Conceptual and Field Studies).                         | Integrating compassionate aspects into mathematics teaching has been proven effective in reducing "mathemaphobia" (fear of learning mathematics), creating a positive classroom climate, and increasing the emotional independence of elementary school students in understanding calculation concepts. |
| 6.  | Frazier, T., Roeser, R.W., Schonert-Reichl, K.A., & Negi, L.T. (2025)      | Evaluating the feasibility and initial impact of the Social, Emotional, and Ethical Learning (SEE) program: A compassion-based social and emotional learning program for elementary school children. | Quasi-Experimental trial with a control group and an experimental group intervened by the SEE Learning program. | The implementation evaluation showed that this emotion and compassion-based program was highly feasible for teachers to implement, and had a significant initial impact on improving student's prosocial behavior, emotional regulation, and emotional well-being.                                      |
| 7.  | Jazaieri, H. (2018)                                                        | Compassionate education from preschool to postgraduate: Bringing a culture of compassion into the classroom.                                                                                         | Critical Literature Review and Theoretical Conceptual Analysis (PK-20).                                         | This research successfully developed a practical framework for teaching compassionate values from preschool through postgraduate levels. It demonstrated that compassion-based education has been empirically proven to improve student's mental health and academic motivation.                        |

| No. | Author & Year                                       | Article Title                                                                                                                                      | Research Method / Development Model                                             | Research Results (Validity, Practicality, Effectiveness)                                                                                                                                                                                               |
|-----|-----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8.  | Andhany, E., & Maysarah, S. (2023)                  | Development of Interactive Digital Learning Modules Based on Mathematical Literacy                                                                 | Research and Development (R&D) uses the ADDIE model.                            | The validity of the material reached 83.30% and the media reached 94.44%. Practicality was assessed at 84.23% (very practical). Effectiveness was demonstrated by the achievement of a classical mastery level of 80% among higher education students. |
| 9.  | Feriyanti, N., Hidayat, S., & Asmawati, L. (2019)   | Development of e-Mathematics Modules for Elementary School Students (Development of Electronic Mathematics Modules for Elementary School Students) | Research and Development (R&D) uses the Borg and Gall model (9 stages).         | The average validation from Subject Matter Experts (92.20%), Language Experts (88.33%), and Media Experts (80.67%) was 83.52%, and it was proven effective in improving student's mathematics learning achievement after the test.                     |
| 10. | Anggristia, S., Yohanie, DD, & Handayani, AD (2022) | The Effect of Using Learning Modules on Mathematics Learning Outcomes and Motivation                                                               | Quantitative Quasi-Experimental Design using Unequivalent Control Group Design. | The results of the statistical analysis (independent t-test) show that the use of mathematics learning modules significantly influences increasing learning motivation as well as improving student's independent cognitive learning outcomes.         |

For synthesize proof empirical data obtained from ten article selected in a way systematic, grouped data analysis to in three main domains that are interconnected related: achievements cognitive, transformation affective, and digital media feasibility. Metrics quantitative like improvement average score, score gain, effect size, up to percentage validation expert analyzed in a way comparative for clarify connection cause and effect between damping obstacle emotional and improvement understanding draft mathematics. Results of empirical data synthesis the visualized in the graphs below this, which shows improvement results study through GASING method, reduction anxiety drastic academic through approach *compassionate teaching*, as well as height eligibility technical integration both of them to in e- module interactive.

Following is graph showing improvement results Study through the GASING method in figure 2.

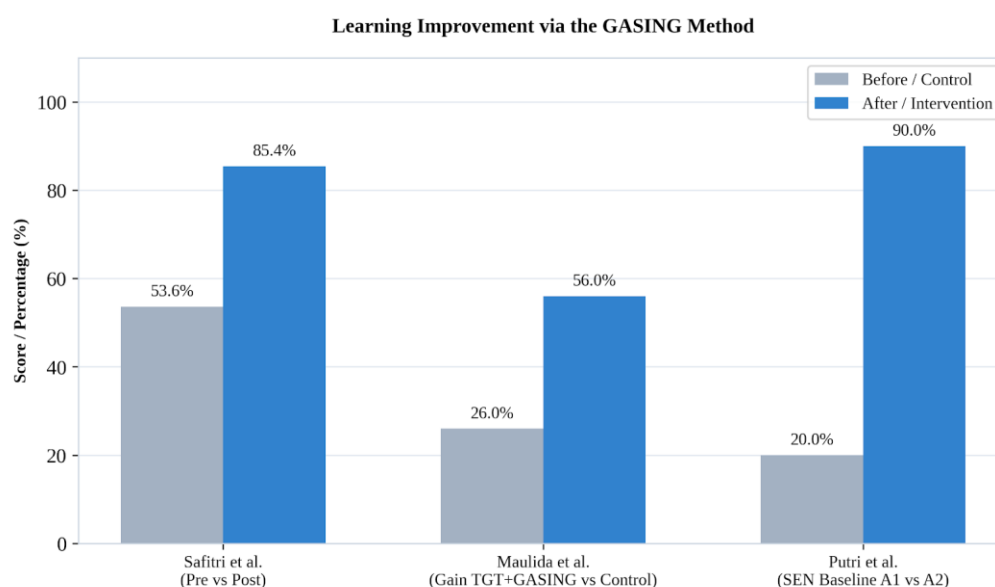


Figure 2. Improvement results Study through the GASING Method

The effectiveness of the GASING method in general consistently proves a significant impact in improving elementary school student's numeracy skills in the concept of two digit multiplication. Quantitative data real from (Safitri et al., 2025) on students Grade IV ( Stage B) showed a sharp increase in the average score from 53.6 in the pre-test to 85.4 in the post-test. This success was reinforced by the score Asymp. Sig. < 0.001 through the Wilcoxon test and the N-Gain score achieved was 69.51%, which places the GASING method in the moderate to high effectiveness category for improving procedural understanding mathematics independent students.

Improvement cognitive This become more optimal when the GASING method is integrated with the Teams Games Tournament (TGT) collaboration model, studies quasi-experimental by (Maulida et al., 2024) show difference a very significant effect between the experimental and control classes through the Mann Whitney test (Sig = 0.01 < 0.05). The improvement score data proves that the combined TGT and GASING class experienced an increase of 0.56 (moderate category), far exceeding the conventional class which only reached 0.26. This empirical data confirms that packaging GASING syntax into a group game tournament can double students two digit multiplication memory retention.

The positive impact of the GASING method also shows high inclusivity for children with special needs. Based on Single Subject Research (SSR) with an A1-B-A2 design by (Putri & Anggraini , 2025) the method This proven to be highly effective in improving the multiplication skills of children with mild intellectual disabilities. Data show that children's target abilities increased drastically from baseline (baseline A1) by 20% to 80%–100% during intervention (B), and remained stable at 80%–100% after the intervention was stopped (baseline A2). This absolute effectiveness is confirmed by the percentage of data overlap of 0%,

indicating that positive behavioral changes in students are entirely influenced by the concrete steps of the GASING method.

Theoretically and methodologically, all the quantitative findings above are in line with the content analysis conducted by (Yuliani et al., 2024) through studies Literature. Data from their literature review concluded that the essence of the GASING method's success lies in the concept reconstruction process that strictly guides children through the stages of concrete (real objects), abstract (symbols), and conjecture (mental mathematics). This pattern successfully facilitates the understanding of basic mathematical concepts from the abstract to the concrete, thus psychologically reducing math anxiety and improving activity student . Following is graph showing the effect of the intervention affective (compassionate teaching) to anxiety mathematics and emotion regulation, and the ripple effects of affective interventions on cognitive capacity and motivation study in figure 3.

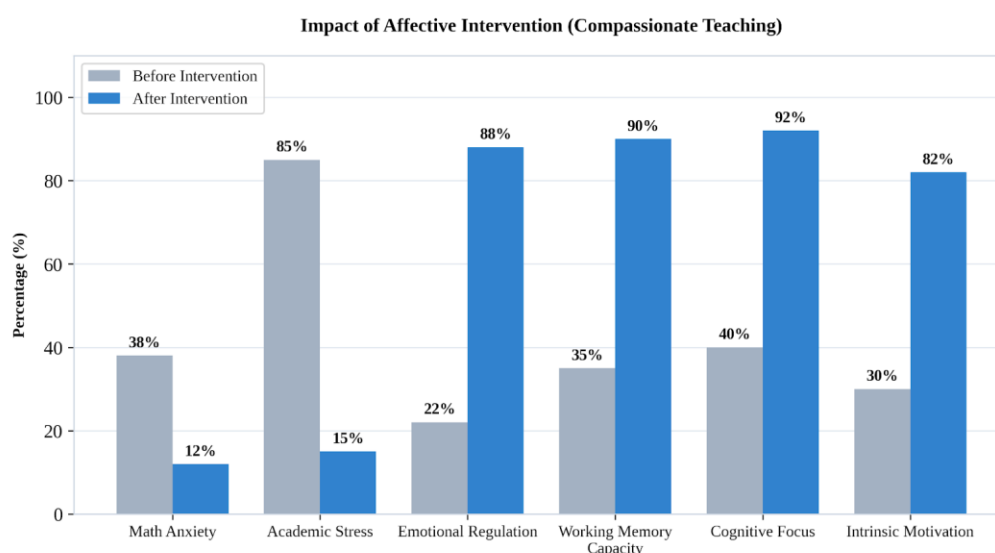


Figure 3. Impact intervention affective compassionate teaching

Compassionate teaching confirm readiness emotional as an absolute prerequisite for cognitive functioning in complex numeracy materials such as multiplication. A study by (Rohman et al., 2024) identify mathematics school base as a trigger for cognitive stress, academic trauma, and fear excessive (mathemaphobia). Their research highlights the urgency of compassion-based teaching to build a psychologically safe classroom climate to reduce math anxiety and restore motivation intrinsic students. Impact This supported by quantitative data from a quasi- experiment (Frazier et al., 2025) evaluated the Social, Emotional, and Ethical Learning (SEE) program for elementary school children. Post-program outcomes showed significant improvements in children's emotion regulation, interpersonal competence, and prosocial behavior. Observational data confirmed that effectively managing negative emotions frees children's working memory capacity from mental blocks, directly improving their focus and cognitive readiness.

Conceptually, these findings are consistent with research by (Jazaieri , 2018) which confirms that culture Caring by teachers is positively correlated with reduced academic stress. When teachers listen to student's difficulties without judgment, their enthusiasm and active engagement in self-directed learning doubles. The synthesis of these three articles provides a strong theoretical foundation for the novelty of this research: embedding compassionate teaching principles (warm narratives, elimination of digital punishment, and prompt, friendly feedback) into a digital multiplication module effectively reduces math anxiety and increases intrinsic motivation in elementary school students. The following chart shows the level of validity and practicality of the interactive digital module, presented in Figure 4.

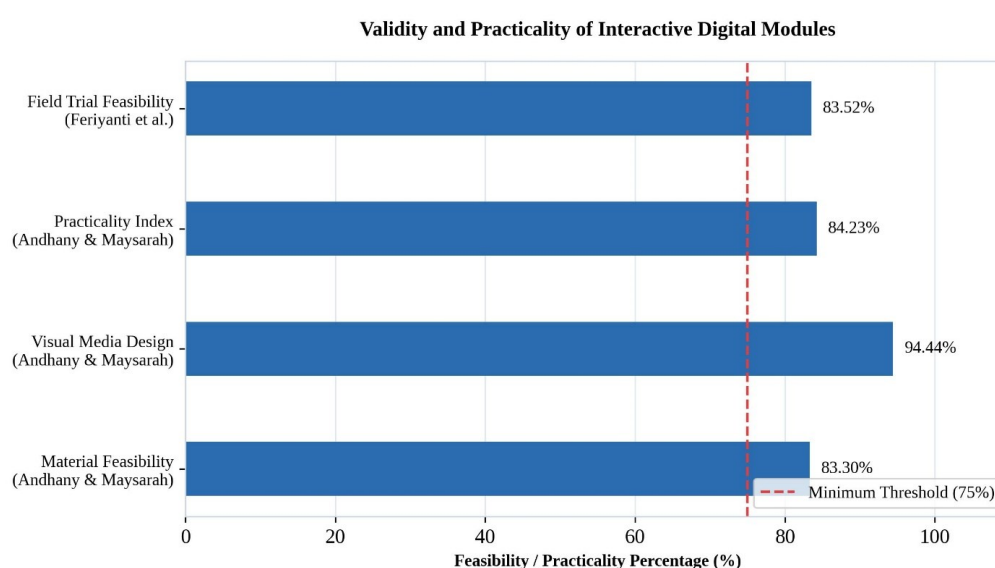


Figure 4. Validity and Practicality of the Digital Module

Based on the analysis of product development results by (Andhany & Maysarah, 2023) this digital module demonstrated a very high level of validity from experts, with the percentage of material feasibility reaching 83.30% (valid category) and visual media design reaching 94.44% (very valid category). This high technical validity is directly proportional to the end user perception, as indicated by the practicality index of 84.23% which categorizes this electronic module as a "Very Practical" and intuitive medium for students to navigate. This consistency of practicality is reinforced by the results of large scale field tests at the elementary school level by (FeriYanti et al., 2019) which recorded an average feasibility of 83.52% a figure that exceeds the minimum threshold of product feasibility of 75%.

Overall, the integration of expert validity scores and field practicality proves that the digital module has a mature platform architecture to align students cognitive and affective needs simultaneously. When this valid and practical media functions as a learning medium for multiplication using the GASING method, its interactive

features can facilitate the transition of understanding from the concrete to the abstract visually. At the same time, the high ease of media access provides optimal space to apply the principles of *compassionate teaching* through child-friendly instructions, the elimination of intimidating feedback, and the provision of instant positive reinforcement. Thus, this empirical evidence provides scientific assurance that the development of the GASING Digital Module Based on *Compassionate Teaching* has a very convincing level of technical usability to optimally encourage student independent learning.

A synthesis of ten selected articles revealed that low multiplication skills in elementary schools are driven by methodological weaknesses and high levels of math anxiety (*mathemaphobia*). The integration of the GASING method (Easy, Fun, and Enjoyable) has consistently proven effective in overcoming these conceptual barriers by guiding students from the concrete to the abstract in a gradual, inclusive, and adaptive manner. This approach is suitable for both regular students and children with special needs (Maulida et al., 2024; Putri & Anggraini, 2025; Safitri et al., 2025; Yuliani et al., 2024). However, this cognitive effectiveness requires emotional readiness, the application of *Compassionate Teaching* and social-emotional learning is present to create a psychologically safe classroom climate, proven to reduce academic stress while increasing emotional regulation and intrinsic motivation of students (Frazier et al., 2025; Jazaieri, 2018; Rohman et al., 2024). By utilizing interactive digital modules, the synergy between educational technology, the GASING method, and this humanistic approach as a whole creates a cognitively effective learning environment, supports emotional well being, and is in line with the demands of 21st-century education.

In a way theoretical, synergy the relationship between these three pillars can be explained through the close relationship between working memory capacity and student's mathematical performance. When math anxiety arises, a large portion of student's working memory capacity is diverted to processing worries and negative thoughts about failure, so the remaining cognitive space for following the procedural steps of multiplication becomes very limited, in line with the finding that the optimization of the brain's working memory capacity can increase by up to 90% when emotional barriers are removed. Under these conditions, no matter how strong the pedagogical design of the GASING method is in guiding students from the concrete to the abstract and conjecture stages, its effectiveness will be reduced if students remain trapped in a psychologically stressed state. Thus, Empathetic Teaching does not function merely as a complement to the affective side, but rather as a prerequisite that opens up cognitive space for the GASING method to work optimally, a consistent mediating relationship. with findings (Aldrup et al., 2022) regarding the role of teacher empathy as a determinant of the quality of teacher- student interactions , as well as results intervention (Frazier et al., 2025) which proves that strengthening Social-emotional competence empirically improves emotional regulation in elementary school-aged children. In other words, the cognitive aspect (GASING) and the affective aspect (Empathy Teaching) do not work in parallel and separately, but rather mutually require each other in the same causal chain.

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To bridge the potential of the GASING method and an empathetic teaching approach so that it can be accessed flexibly and independently by students, the use of technology in the form of digital teaching tools is a necessity. The development of modern technology-based teaching media must refer to valid, practical, and effective development standards. Referring to R&D research by (Andhany & Maysarah, 2023) using the ADDIE model, and (FeriYanti et al., 2019). Using the Borg and Gall model, the development of interactive digital modules has proven highly feasible and effective in fostering student independence and achievement in mathematics learning. The flexibility and rich visualizations offered by e-module technology can accommodate student's varying learning speeds continued, (Anggristia et al., 2022). In experiment they, look that the use of structured modules not only impacts cognitive learning outcomes, but also simultaneously encourages a significant increase in self-learning motivation.

Based on the convergence of the ten articles above, a new orientation that can be offered is to design a GASING Based Digital Module compassionate teaching for student Elementary school. In this digital module, the step by step multiplication guide syntax of the GASING method (concrete and abstract) is presented through interactive multimedia visualizations, concrete animations, and fun numeracy games to facilitate understanding of multiplication concepts. integrative, principles teaching Affection is embedded in the module's interface and narrative through user friendly, quick feedback features, supportive motivational messages when students make mistakes, and emotional reflection spaces. This innovative combination creates a digital learning support system that is not only cognitively friendly through the advantages of the GASING method but also affectively friendly. Ultimately, this combination becomes a valid and practical strategic solution to reduce math anxiety, increase student enthusiasm for learning, and optimize in-depth understanding of multiplication concepts in elementary school.

The role of digital modules in this integration is not merely a passive delivery vehicle, but rather a medium that actively operationalizes the cognitive and affective pillars simultaneously and continuously. At the cognitive level, multimedia visualizations and interactive animations enable the concrete, abstract, and abstract stages of the GASING method to be presented consistently and can be repeated at the learner's own pace. each student's learning (Andhany & Maysarah, 2023; Feriyanti et al., 2019). At the affective level, features Instant feedback, non-judgmental motivational messages when students make mistakes, and emotional reflection spaces deliver the core elements of Empathetic Teaching in a programmatic and consistent manner, without relying solely on the teacher's physical presence or emotional state at any given moment.

This combination creates a continuous cycle of reinforcement: reducing anxiety through affective support frees student's cognitive capacity to understand multiplication concepts more deeply; increased understanding then leads to successful experiences that foster confidence; and that growing confidence further reduces math anxiety in subsequent learning sessions. This cycle is what makes the integration of these three pillars progressive and sustainable, rather than a single intervention that stops at a single point of success, as reflected in findings

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(Anggristia et al., 2022) that use module structured simultaneously to improve student's cognitive learning outcomes and independent learning motivation in a sustainable manner.

This review has several limitations, including the relatively small final sample size (10 out of 73 identified articles), requiring caution in generalizations. The search scope only included four databases (Google Scholar, DOAJ, and Garuda) without Scopus or Web of Science. The limitations include the year range (2018–2025) and language (Indonesian and English). Most fundamentally, the purely theoretical synthesis nature of the review means that the proposed GASING Digital Module design based on Compassionate Teaching has not been empirically tested directly on elementary school students.

Therefore, further research and development (R&D) using the ADDIE or Borg and Gall models needs to be continued to the implementation and field evaluation stage through quasi-experimental designs with control groups, involving a more diverse sample of students (regular and special needs, across levels and regions), using psychometrically validated math anxiety instruments, and ideally, a longitudinal approach to empirically prove whether the reinforcing cycle between reduced anxiety and increased understanding of multiplication concepts is truly sustainable in the long term.

#### **4. Conclusion**

Based on the analysis and synthesis of the ten reviewed literature articles, it can be concluded that optimizing mathematics learning at the elementary school level requires an integrated approach that addresses both the cognitive and affective aspects of students. From the cognitive dimension, the application of the GASING method has been empirically proven to be very effective in facilitating conceptual understanding and procedural skills in multiplication operations through systematic learning stages, starting from concrete visualization to abstract mental calculations. On the other hand, from the affective dimension, the integration of an empathetic teaching approach plays a crucial role in reducing math anxiety, fostering good emotional regulation, and building a safe and supportive learning environment for children. When these two pillars are realized in modern teaching media in the form of interactive digital modules designed through structured development models (such as ADDIE or Borg and Gall), the product is proven to meet the criteria of validity, practicality, and high effectiveness in encouraging student motivation and learning independence.

As a theoretical and practical implication of this review, the idea of designing a GASING Based Digital Module Compassionate Teaching become solution a new, highly strategic approach to multiplication in elementary schools. This integration creates an inclusive learning medium that is not only cognitively friendly by adopting the easy visualization of the GASING method, but also psychologically friendly through the supportive feedback features and motivational messages that are characteristic of compassionate teaching. Through this adaptive digital

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medium, student's emotional barriers to mathematics can be gradually eroded, thereby stimulating their enthusiasm for learning while simultaneously increasing their understanding of multiplication concepts in a deep and sustainable manner.

### Thank you note

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### References

- Aldrup, K., Carstensen, B., & Klusmann, U. (2022). Is Empathy the Key to Effective Teaching? A Systematic Review of Its Association with Teacher-Student Interactions and Student Outcomes. *Educational Psychology Review*, 34(3), 1177–1216. <https://doi.org/10.1007/s10648-021-09649-y>
- Aminullah, A., & Irwansya, I. (2024). Analisis Efektivitas Penggunaan Teknologi dalam Pembelajaran Matematika. *JagoMIPA: Jurnal Pendidikan Matematika dan IPA*, 4(4), 678–687. <https://doi.org/10.53299/jagomipa.v4i4.721>
- Andhany, E., & Maysarah, S. (2023). Pengembangan Modul Pembelajaran Digital Interaktif Berbasis Literasi Matematika. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, 12(3), 3503–3515. <https://doi.org/10.24127/ajpm.v12i3.6299>
- Anggristia, S., Yohanie, D. D., & Handayani, A. D. (2022). Pengaruh Penggunaan Modul Pembelajaran terhadap Hasil Belajar dan Motivasi Belajar Matematika. *HISTOGRAM: Jurnal Pendidikan Matematika*, 6(1), 29–43. <https://doi.org/10.31100/histogram.v6i1.1538>
- Attalina, S. N. C., & Irfana, S. (2020). Peningkatan Kemampuan Pemahaman Konsep Dasar Perkalian dengan Menerapkan Model Pembelajaran PBL (Problem Based Learning) Berbantuan Media Pembelajaran Tolkama (Botol Perkalian Matematika) Pada Peserta Didik Kelas Ii Sekolah Dasar. *Jurnal Pendidikan Dasar*, 2.
- Bayu, C. P., Yohanie, D. D., & Handayani, A. D. (2022). Pengaruh Penggunaan Modul Matematika Terhadap Minat dan Prestasi Belajar Smk PGRI 2 Kediri. *HISTOGRAM: Jurnal Pendidikan Matematika*, 6(1), 15–28. <https://doi.org/10.31100/histogram.v6i1.1518>
- Feriyanti, N., Kadumerak, S. N., & Km, J. R. S. (2019). *Pengembangan E-Modul Matematika Untuk Siswa Sd*.
- Fitriana, E., & Khoiri Ridlwan, M. (2021). Pembelajaran Transformatif Berbasis Literasi dan Numerasi Di Sekolah Dasar. *TRIHAYU: Jurnal Pendidikan Ke-SD-an*, 8(1). <https://doi.org/10.30738/trihayu.v8i1.11137>
- Frazier, T., Roeser, R. W., Schonert-Reichl, K. A., & Negi, L. T. (2025). Evaluating the feasibility and preliminary impact of the Social, Emotional, and Ethical (SEE) Learning program: A compassion-based social and
-

- 
- emotional learning program for elementary school children. *PLOS One*, 20(8), e0328519. <https://doi.org/10.1371/journal.pone.0328519>
- Hasibuan, F. H. (2024). *Penerapan Media Pembelajaran Papan Pintar Perkalian dalam Pelajaran Matematika di Desa Bah Jambi*. 5.
- Iskhakova, L., Hoffmann, S., & Hilbert, A. (2017). Alumni Loyalty: Systematic Literature Review. *Nonprofit and Journal of Public Marketing*, 29(3), Sector 274–316. <https://doi.org/10.1080/10495142.2017.1326352>
- Jazaieri, H. (2018). Compassionate education from preschool to graduate school: Bringing a culture of compassion into the classroom. *Journal of Research in Innovative Teaching & Learning*, 11(1), 22–66. <https://doi.org/10.1108/JRIT-08-2017-0017>
- Maulida, S. A., Isrokatun, I., & Julia, J. (2024). Pengaruh Pembelajaran Kooperatif TGT dengan Metode GASING Terhadap Pemahaman Konsep Matematis Perkalian Dua Angka di SD. *SJME (Supremum Journal of Mathematics Education)*, 8(1), 101–113. <https://doi.org/10.35706/sjme.v8i1.10789>
- Moher, Douglas G. Altman, D., Liberati, A., & Tetzlaff, J. (2009). *Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement*.
- Muhaimin, Y. Y., Wardani, S., Subali, B., & Widiati, N. (2025). *Digital Based Mathematics Learning in Primary Education: Systematic Literature Review*. 9(4).
- Oktama, Z., Yulastri, W., & Kharisma, A. (2026). *Interactive Media Development Using Augmented Reality Applications to Improve Student Learning Outcomes in Mathematics Learning in Grade V Elementary School*. 10(1).
- Putri, A. I., & Anggraini, R. D. (2025). *Development of a Problem Based Learning Teaching Module on the Topic of Comparison to Facilitate Mathematical Reasoning Skills of Phase D Students*. 9(5).
- Rohman, K., . T., Budimansyah, D., Syaodih, E., & Cahya Maulidiyah, E. (2024). Bringing Compassion to Mathematics Learning in Elementary School. *KnE Social Sciences*. <https://doi.org/10.18502/kss.v9i13.15925>
- Safitri, M., Iriawan, S. B., & Mufliva, R. (2025). The Effectiveness of the GASING Method in Improving Mathematical Procedural Understanding Ability in Multiplication Among Phase B Elementary School Students. *PALAPA*, 13(2), 238–248. <https://doi.org/10.36088/palapa.v13i2.5908>
- Senda, T. A., Mayasari, L. I., & Huda, S. A. (2026). *Mapping Studies on Teachers' Pedagogical Competence and Its*. 10(5).
- Suarmita, S., Suarman, S., & Gusnardi, G. (2025). Development of Multimedia-Based Interactive Module Teaching Materials to Increase Learning Independence Learners. *Journal of Education and Learning Research*, 2(2), 141–151. <https://doi.org/10.62208/jelr.2.2.p.141-151>
- Soeharso, SY 2023. *Metode Penelitian Bisnis*. Yogyakarta: ANDI.
- Sulistiyarini, D., & Sabirin, F. (2020). 21st Century Literacy Skill of Information Technology and Computer Education Students. *JPI (Jurnal Pendidikan Indonesia)*, 9(4), 576. <https://doi.org/10.23887/jpi-undiksha.v9i4.24432>
- Yuliani, N. P., Antari, N. W. A., Wulandari, P. S., Saspanya, K. D., Prayoga, I. W. E. A., Yasa, I. M. B. P., & Werang, B. R. (2024). Effectiveness of Applying the GASING Method in Multiplication of Two-Digit Numbers
-

in Elementary Schools. *Formosa Journal of Applied Sciences*, 3(7), 3003–3018. <https://doi.org/10.55927/fjas.v3i7.9896>

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