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Enhancing Teacher Competence in Coding Through Gamified Training: A Kirkpatrick Evaluation

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ABSTRACT
Background: The Indonesian government, through the Ministry of Primary and Secondary Education (Kemendikdasmen), plans to implement coding and artificial intelligence learning programs in schools starting the 2025/2026 academic year. SMP Negeri 56 Palembang seeks to prepare by enhancing teacher competence in coding, as 56.8% of teachers initially had no basic coding knowledge.
Purpose of the Study: This study aims to provide basic coding knowledge to teachers and develop skills in utilizing educational games (Blockly Game Maze) as interactive learning media that can be integrated into the learning process.
Methods: Training and workshops were conducted involving 37 teachers from various subjects. A Kirkpatrick model evaluation was applied across four levels: reaction (participant satisfaction), learning (pre-test and post-test comparison), behavior (classroom observation during mentoring), and results (overall program effectiveness). Participants used e-modules and practiced with Blockly Game Maze educational games.
Results: The reaction level showed a 94.59% satisfaction rate, indicating high relevance of training materials. The learning level demonstrated a 27.03% increase in coding competency, with participants previously unfamiliar with basic coding (56.8%) beginning to master basic logic and coding structures. At the behavior level, students in five groups successfully completed Blockly Game Maze up to level 6 (100%), with three groups completing level 7. These findings prove that the training not only provided theoretical insights but also successfully built teachers' confidence in adopting new technologies to support the learning process.

Keywords
Coding; Kirkpatrick Model; Teacher Competence; Gamified Training; Blockly Game Maze; Computational Thinking; Digital Literacy; Community Service

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Introduction

The Indonesian government, through the Ministry of Elementary and Secondary Education, has established a national program for the implementation of coding and artificial intelligence (AI) learning starting in the 2025/2026 academic year as part of the seven priority national education programs outlined in the 2025 National Consolidation (Menpan RI, 2025). This policy aims to equip students with 21st-century competencies such as computational thinking, critical reasoning, creativity, and problem-solving, which are key needs in the era of Industry 4.0 and Society 5.0. Coding implementation is carried out in stages, starting from elementary school level through unplugged activities up to junior high and high school levels with structured materials related to basic algorithms and block- and text-based programming. The implementation of this policy is highly dependent on teachers' readiness to understand coding concepts and utilize technology in the learning process (Hoesny & Darmayanti, 2021).

SMP Negeri 56 Palembang is one of the schools preparing to implement this program. Based on field observations, the school has the potential to provide adequate technological infrastructure and human resources, but teachers lack the competency to learn coding or use digital-based learning media. This is because teachers have not participated in coding training, whether conducted independently or through government programs. Based on the evaluation results, it was found that 56.8% did not know basic coding. Despite the school's vision to foster students' logical and critical thinking skills, strengthening teacher competencies is an urgent need to ensure the school can keep pace with the government's educational transformation efforts. Furthermore, the use of technology as a learning medium is believed to improve the quality of learning and the effectiveness of material delivery.

Several studies have shown that coding learning offers broad benefits for the development of higher-order thinking skills. Visual programming approaches such as Scratch and Blockly have been shown to facilitate students' understanding of logical operations, algorithmic patterns, and abstract programming concepts through visualized instructions (Totan & Korucu, 2023). Coding also enhances creativity and problem-solving, and supports mathematics and science learning through project-based learning, enabling students to independently build digital solutions (Waite & Sentance, 2021). However, its implementation in schools still faces challenges such as limited teacher competency and a lack of experience in digital pedagogy, making training key to successful coding learning (Zhang & Nouri, 2019).

One of the media widely used in developing computational thinking is Blockly Games, a web-based platform with a block-based coding interface that facilitates the understanding of basic concepts such as instruction sequences, repetition, branching, and logical problem solving. Various studies have demonstrated the effectiveness of Blockly Games in improving students' computational skills and positive attitudes toward programming learning (Iqbal & Widodo, 2025; Magreñán-Ruiz et al., 2024). Its advantages include easy access, gradual levels, and a game-based design (serious game) that increases student motivation and engagement.

To ensure the effectiveness of teacher training programs, the Kirkpatrick evaluation model is used because it comprehensively assesses training effectiveness across four levels: reaction, learning, behavior, and results. This model has been widely used in education and training because it can measure increases in participant knowledge, changes in teaching behavior, and the impact on student learning (Aminah, 2015; Syah et al., 2025). The use of this model is relevant for evaluating the success of coding training and the use of digital media for junior high school teachers.

Considering the needs of partners and the demands of national policy, this community service activity is designed to improve the competency of teachers at SMP Negeri 56 Palembang in understanding basic coding concepts and utilizing educational games as interactive media. This activity is expected to strengthen teachers' abilities in implementing coding lessons, improve the

quality of the teaching and learning process, and support the digital transformation of education in accordance with the policy direction of the Ministry of Primary and Secondary Education.

Method

The teaching and learning activities between the proposing team and SMP Negeri 56 Palembang, as the target partner, will be carried out through training, workshops, and mentoring. The proposing team consists of eight lecturers and seven students from different study programs/majors with relevant competencies. The implementation method used can be seen in Figure 1.

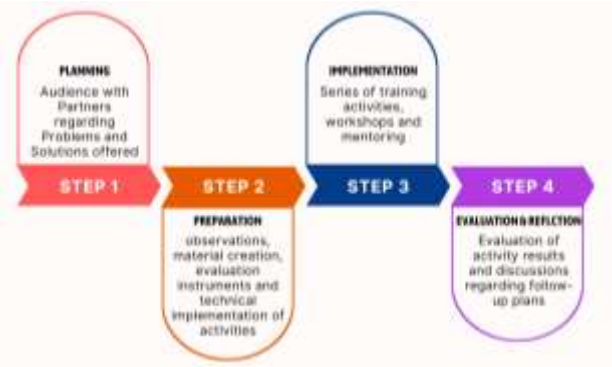

Figure 1. Implementation Method

This Community Service activity was implemented through three main series, namely basic coding training for teachers, a workshop on the use of educational games, and mentoring for teachers. During the training and workshop, the implementation team was tasked with preparing materials, pre-test and post-test instruments, and all administrative files, while the target partners prepared the venue and supporting facilities; both activities began with registration and a pre-test, continued with the delivery of core materials, and concluded with a post-test. After the training and workshop, the implementation team provided mentoring by directly observing the learning process in the classroom and evaluating students' understanding based on their ability to complete the Blockly Game Maze game.

To determine the success rate of the solutions offered to target partners, the implementation team will evaluate the implementation of the activities using the Kirkpatrick model. The Kirkpatrick model is a quantitative analysis model that categorizes training/workshop results into four levels: reaction, learning, behavior, and result (Aminah, 2015).

1. Reaction: At this stage, participants' satisfaction with the training program will be measured. Five indicators can be used to measure the success of the training/workshop: participant satisfaction, increased knowledge, presentation effectiveness, speaker quality, and material quality (Syah et al., 2025; Tri Octafian & Fatmariani, 2021).
2. Learning: At this stage, participants will be asked a series of questions to gauge their level of understanding of the training material (Dachliyani, 2020).
3. Behavior: At this stage, the implementation team will provide support to target partners by observing the learning process. Students who have received coding lessons from the teachers who received the training will have their understanding of the material assessed. Student understanding can be assessed based on their ability to complete the Blockly Game Maze.

Results: At this stage, the overall evaluation results will be compiled to develop a follow-up plan for the activities.

Result

The community service activity was held on Saturday, November 1, 2025, with 37 teachers participating. The number of participants has reached 86% of the target of 43 teachers at SMP Negeri 56 Palembang. Six teachers were excused from participating. The distribution of participants by gender and subjects taught can be seen in figure 2.

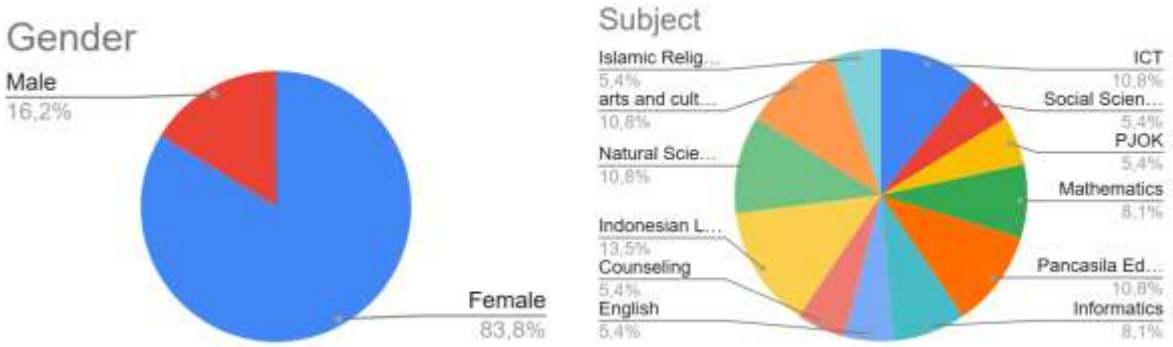

Figure 2. Distribution of Participants by Gender and Subject

Based on figures 2, it can be seen that 16.2% of the training participants were male and 83.8% were female. The distribution of teachers based on the subjects taught was as many as 5.4% were Islamic Religious Education teachers, 10.8% were arts and culture teachers, 10.8% were Natural Sciences teachers, 13.5% were Indonesian Language teachers, 5.4% were Counseling teachers, 5.4% were English teachers, 10.8% were ICT teachers, 5.4% were Social Sciences teachers, 8.1% were Mathematics teachers, 10.8% were Pancasila Education teachers, and 8.1% were Informatics teachers.

During the event, all participants were instructed to bring a laptop or tablet to support the training and workshop. All participants were provided with an e-module accessible at https://bit.ly/ModulPKM56, while the material presented by the speakers was accessible at https://bit.ly/MateriPKM56. Documentation of the event series can be seen in figures 3.

Figure 3. Material Presentation and Documentation of All Participants

After the teaching and learning activities took place, teacher mentoring was carried out during the teaching and learning process of Informatics. The mentoring was carried out on Friday, November 7, 2025, in Class 9.3, taught by Ms. Meiti Diknasari, S.Pd. The mentoring was carried out as a form of evaluation of the results of the training and workshops that had been given to teachers. Documentation of the teacher mentoring activities can be seen in figures 4.

Figure 4. Teacher Explains Coding Material

Based on the evaluation results conducted using the Kirkpatrick model, the following results were obtained for each level:

Reaction

After the series of training and workshop activities, all participants were asked to provide an assessment regarding participant satisfaction, knowledge gain, presentation effectiveness, speaker quality, and material quality. The evaluation results indicated a 94.59% success rate for the training and workshop. Details of the evaluation results can be seen in Table 1.

Table 1. Training Success Evaluation Results

No	Questions	Agree	Not Agree
1	The material presented was relevant to my needs as an educator/participant.	35	2
2	The explanations were easy to understand.	34	3
3	I gained new knowledge and skills after participating in this activity.	36	1
4	The material provided motivated me to immediately try integrating it into the learning process.	34	3
5	The facilitator/lecturer who delivered the material had a very good grasp of the topic.	35	2
6	The facilitator/lecturer was able to explain the material in clear, straightforward, and easy-to-understand language.	36	1
7	The facilitator/lecturer was friendly, responsive, and provided space for discussion and questions.	35	2

Learning

Measuring the increase in participants' knowledge and understanding related to the training and workshop materials, participants will answer a number of questions to measure the level before (pre-test) and after (post-test) participants receive the training and workshop materials. The list of pre-test questions can be seen at the following link https://bit.ly/PrePKM56, while the post-test questions can be seen at the following link https://bit.ly/PostPKM56. Based on the evaluation results, it was found that 56.8% did not know basic coding before, as shown in Figure 5. Overall, it can be stated that there was an increase in participants' knowledge and understanding regarding coding by 27.03%, as shown in Figure 6.

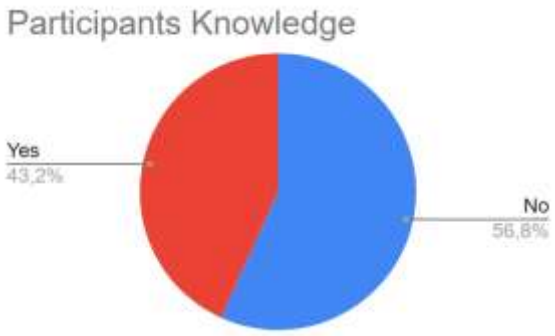

Figure 5. Participants Knowledge

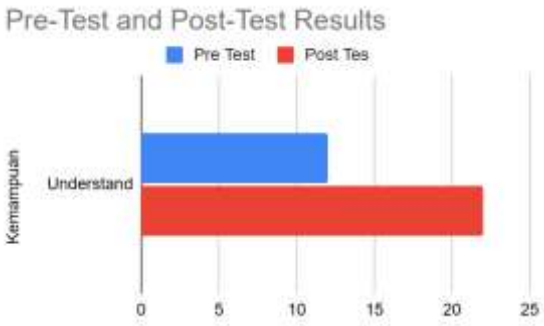

Figure 6. Pre-Test and Post-Test Results

Based on the evaluation results, more detailed information can be provided regarding participants' understanding of each question. The number of participants who answered question 1 correctly increased by 2.70%, question 2 by 16.22%, question 3 by 24.32%, question 4 by 56.76%, question 5 by 13.51%, question 6 by 13.51%, and question 7 by no increase. This can be seen in Figure 7.

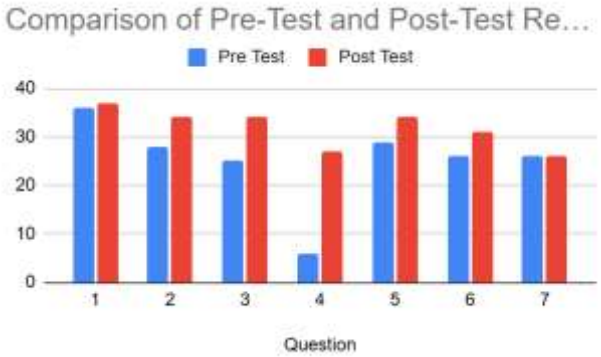

Figure 7. Comparison of Pre-Test and Post-Test Results for each Question

Behavior

Based on observations during teacher mentoring, it can be stated that students were enthusiastic about participating in the learning process. When using the educational game media, Blockly Game Maze, students were divided into 5 groups consisting of 5-6 students. Each group simultaneously completed each level of the Blockly Game Maze game. All groups were able to complete the Blockly Game Maze game up to level 6, and the three fastest groups were able to successfully complete level 7.

Table 2. Observations Results

Group	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7
1	Complete	Complete	Complete	Complete	Complete	Complete	Not Complete
2	Complete	Complete	Complete	Complete	Complete	Complete	Complete
3	Complete	Complete	Complete	Complete	Complete	Complete	Complete
4	Complete	Complete	Complete	Complete	Complete	Complete	Not Complete
5	Complete	Complete	Complete	Complete	Complete	Complete	Complete

It can be said that this activity went well based on the evaluation results outlined at the reaction, learning, and behavior levels. However, the results obtained still require more in-depth training to achieve significant competency improvements.

Discussion

Based on the Kirkpatrick model evaluation conducted on the Community Service activities at SMP Negeri 56 Palembang, the activity's success rate of 94.59% indicates that the training material is highly relevant to the teachers' needs. This finding aligns with Zhao et al. (2023), who reported that high satisfaction levels in EMI training were closely linked to participants' perceived relevance of the materials to their professional contexts. The high satisfaction rate in this study was influenced by teachers' awareness of the importance of preparing for the 2025/2026 coding and AI curriculum. However, unlike top-down training models, this program incorporated bottom-up elements: teachers were given opportunities to voice their learning needs during the initial observation phase, and the e-module was made accessible for self-paced exploration. This participatory approach, though not fully collaborative in decision-making, contributed to the positive reaction by fostering a sense of ownership among participants. As Bueno-Baquero et al. (2024) emphasized, deep gamification that includes meaningful participant involvement can enhance motivation, while shallow gamification may only produce superficial engagement.

After the activity was implemented, there was an overall increase in knowledge of 27.03%, a significant achievement considering that 56.8% of participants previously had no basic coding knowledge at all. Analysis per item showed the highest success rate on question 4 (56.76%), indicating that specific concepts were delivered very effectively. However, question 7 showed no improvement, suggesting that certain material remains confusing and needs simplification in future activities. Comparable results were found by Aldabergenova et al. (2026), where gamified programming instruction led to substantially higher learning gains (85–87 points) compared to traditional methods (63–65 points), reinforcing the effectiveness of gamification in coding education.

At the behavior level, the success of Blockly Game Maze implementation in the classroom where all five groups completed level 6 and three groups reached level 7 is consistent with findings by Wang et al. (2024), who demonstrated that unplugged, gamified coding tools enhanced student engagement and team communication. Additionally, Davletova et al. (2026) found that while gamified platforms like Code.org initially increased engagement, motivation could decline over time without meaningful learning tasks and adaptive scaffolding a point that underscores the need for sustained support beyond a single training session.

Conclusion

Based on the Kirkpatrick model evaluation, the Community Service activities were declared successful and effective. At the Reaction level, the satisfaction level of training and workshop participants reached 94.59%. Success at the Learning level was demonstrated by a significant increase in participants' knowledge and understanding of coding by 27.03% based on a comparison of pre-test and post-test results. At the Behavior level, the implementation of training materials in mentoring showed positive results, where students showed high enthusiasm, successfully completing most of the Blockly Game Maze educational game challenges up to level 7 in groups. While this activity has been successful in improving teacher satisfaction and basic knowledge, it is highly recommended that Advanced Training with more in-depth material, such as Python implementation and simple AI concepts, be immediately implemented, accompanied by long-term project-based mentoring. This step is crucial to ensuring that teachers' coding

competencies not only persist but also develop significantly and are continuously integrated into the curriculum of SMP Negeri 56 Palembang.

After teachers acquire basic coding concept knowledge, mentoring is provided to teachers during the learning process. Students are given basic coding material and then understand examples of its application using educational games (Blockly Game Maze). Students are divided into 5 groups of 5-6 students to trigger a collaborative learning process, where students who understand the material more quickly help their peers who are having difficulty. Success reached 100% at Level 6 for all groups, and 3 groups were able to complete Level 7. The results obtained prove that the teaching method using educational games (Blockly Game Maze) is very effective for junior high school students to understand basic coding. This is in accordance with the findings of Indah Hasanah Sukri et al in their research which stated that the Blockly Games application was able to increase the average value of students' Informatics learning outcomes, where the achievement of the Minimum Completion Criteria (KKM) increased from below 70 to 75.35. These results align with research conducted by Arifal Muhamad Iqbal and Suprih Widodo, which found that Blockly Games were effective in helping students understand basic programming concepts and increasing their motivation to learn, with an average score increase of 8.52 between the pre-test and post-test. The use of games has been shown to successfully dismantle the stigma that coding is difficult.

The results of the Kirkpatrick method evaluation are consistent with previous research, which suggests that this method can be used to evaluate training outcomes. This method provides clear direction by focusing on outcomes, reactions, learning, behavioral changes, and increased knowledge, but does not consider individual and contextual factors that can influence training outcomes.

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Conflicts of Interest

Overall, there were no conflicts of interest in the continuation of this activity. However, three participants completed the pre-test but not the post-test, so the total number of participants should have been 40. The activity evaluation used only 37 participants, but this did not affect the results.

References

Aldabergenova, A., Yesseikyzy, U., Yessengabylov, I., Yesseikyzy, A., & Yerkinova, A. (2026). Effectiveness of gamification elements in teaching programming to future informatics

teachers. *International Journal of Information and Education Technology*, *16*(3), 601–610. https://doi.org/10.18178/ijiet.2026.16.3.2532

Aminah, H. (2015). Model Evaluasi Kirikpatrick Dan Aplikasinya Dalam Pelaksanaan Pelatihan (Level Reaksi Dan Pembelajaran) Di Pusat Pendidikan Dan Pelatihan Perum Jakarta. *Jurnal Riset Manajemen Sains Indonesia (JRMSI*, *6*(1), 376–394.

Bueno-Baquero, A., Del Olmo-Muñoz, J., González-Calero, J. A., & Cózar-Gutiérrez, R. (2024). Gamified approaches to computational thinking in teacher training. *Revista de Educacion*, *1*(405), 71–102. https://doi.org/10.4438/1988-592X-RE-2024-405-628

Dachliyani, L. (2020). Instrumen yang Sahih : Sebagai Alat Ukur Keberhasilan Suatu Evaluasi Program Diklat (evaluasi pembelajaran). *MADIKA : Media Informasi Dan Komunikasi Diklat Kepustakawanan*, *5*(1).

Davletova, A., Myrzanova, A., & Sabyrgalieva, M. (2026). Understanding how gamified programming environments shape pre-service teachers' engagement and instructional readiness in Kazakhstan. *Frontiers in Education*, *11*, Article 1749823. https://doi.org/10.3389/feduc.2026.1749823

Friyadi, R., Zakir, S., & Ilmi, D. (2025). Evaluasi Program Daurah (Pelatihan) Tahsin di Markazul Quran Bukittinggi menggunakan Metode Kirkpatrick. *JUTEQ:Jurnal Teologi&Tafsir*, *2*(1), 169–177.

Hoesny, M. U., & Darmayanti, R. (2021). Permasalahan dan Solusi Untuk Meningkatkan Kompetensi dan Kualitas Guru: Sebuah Kajian Pustaka. *Scholaria : Jurnal Pendidikan Dan Kebudayaan*, *11*(2), 123–132.

Iqbal, A. M., & Widodo, S. (2025). Penerapan Media Pembelajaran Blockly Berbasis Website pada Pemahaman Berpikir Komputasional di SDN 10 Nagri Kaler. *Jurnal Pendidikan Tambusai*, *9*(1), 1648–1654.

Magreñán-Ruiz, Á. A., González-Crespo, R. A., Jiménez-Hernández, C., & Orcos-Palma, L. (2024). Development of computational thinking through BlocksCAD, Blockly and problem-solving in mathematics. *Revista Espanola de Pedagogia*, *82*(287), 135–152. https://doi.org/10.22550/2174-0909.3933

Menpan RI. (2025, April 30). Mendikdasmen Paparkan Tujuh Program Prioritas Pendidikan di Konsolidasi Nasional 2025. *Website Menpan*. https://menpan.go.id/site/berita-terkini/berita-daerah/mendikdasmen-paparkan-tujuh-program-prioritas-pendidikan-di-konsolidasi-nasional-2025

Syah, M. B., Mawarni, S., Aswan, D., Yanti, N. E., & Yusuf, N. (2025). Pelatihan Penggunaan AI sebagai Alat dan Kreativitas Tetap Ditangan pada Lingkup Akademik Mahasiswa. *Paramacitra: Jurnal Pengabdian Masyarakat*, *2*(2), 333–341.

Totan, H. N., & Korucu, A. T. (2023). The Effect of Block Based Coding Education on the Students' Attitudes about the Secondary School Students' Computational Learning Skills and Coding Learning: Blocky Sample. *Participatory Educational Research*, *10*(1), 443–461. https://doi.org/10.17275/per.23.24.10.1

Tri Octafian, D., & Fatmariani. (2021). Pembuatan Bahan Ajar bagi Guru Menggunakan Powerpoint di SMK Nurul Iman Palembang. *Ilmu Komputer Untuk Masyarakat*, *2*(2), 55–61.

Utomo, A. P., & Tehupeiory, K. P. (2014). Evaluasi Pelatihan dengan Metode Kirkpatrick Analysis. *Jurnal Telematika*, *9*(2).

Wang, L., Huang, M., & Ismail Kamal, J. (2024). The application of an unplugged and low-cost children's coding education tool in a gamification context. *Pertanika Journal of Social Sciences*

and Humanities, *32*(2), 387–407. https://doi.org/10.47836/pjssh.32.2.03

Waite, J., & Sentance, S. (2021). Teaching programming in schools: A review of approaches and strategies Raspberry Pi Foundation. *www.raspberrypi.org*

Zhang, L. C., & Nouri, J. (2019). A systematic review of learning computational thinking through Scratch in K-9. *Computers and Education*, *141*. https://doi.org/10.1016/j.compedu.2019.103607

Zhao, W., Liu, Z., Wang, T., Yin, X., Sun, Y., Zhang, X., & Yang, H. (2023). Assessment of a training project of English as a media of instruction (EMI) using Kirkpatrick model. *BMC Medical Education*, *23*(1), Article 271. https://doi.org/10.1186/s12909-023-04204-5