

SILICONE DEMONSTRATION ARM COSTUME MODEL FOR IMPROVING IMPLANT CONTRACEPTIVE PRACTICE SKILLS

Farisma Rusdiana Sari, Yulianthi, Sri Nengsih Destriani, Neshy Sulung
Laboratorium Kebidanan, FMIPA, Universitas Bengkulu
farisma@unib.ac.id

Article History

Received: 24 November 2024, Accepted: 30 May 2025, Published: 30 May 2025

Abstrak

Penelitian ini ditujukan untuk mengembangkan alat peraga pemasangan kontrasepsi implan dalam upaya mengurangi resiko komplikasi, kegagalan dan trauma pada pasien. Peraga didesain berbentuk kostum untuk melatih mahasiswa dalam mengatur posisi, menginsisi kulit lengan atas bagian dalam dan melatih komunikasi terapeutik dan umpan balik pada klien. Metode penelitian yang digunakan adalah metode penelitian dan pengembangan (*research and development*). Uji Validasi dilakukan oleh judgement ahli, yakni dosen pengampu mata praktikum pemasangan kontrasepsi implan. Tahap ini bertujuan, untuk memastikan alat peraga layak digunakan oleh praktikan menggunakan instrumen kuisioner dan wawancara, dengan hasil uji validasi lengan peraga silikon model kostum layak digunakan, selanjutnya dilakukan uji coba oleh praktikan, dan diperoleh hasil desain lengan peraga sesuai dengan anatomi manusia lengan bagian dalam, lengan peraga mudah dilakukan insersi tabung implan, lengan peraga nyaman saat digunakan sebagai kostum, dan lengan peraga mudah dan berfungsi dengan baik saat digunakan. Hasil uji persepsi diperoleh lengan peraga silikon model sesuai dengan materi dan tujuan pembelajaran serta dapat meningkatkan minat, keterampilan berfikir, dan keinginan belajar lebih lanjut pada praktikum pemasangan kontrasepsi implan.

Kata Kunci: Lengan Peraga; Silikon; Praktikum Kontrasepsi Implan

Abstract

This research aims to develop a training tool for implant contraceptive insertion in an effort to reduce the risk of complications, failure, and trauma in patients. The tool is designed in the form of a costume to train students in positioning, incising the inner upper arm skin, and practicing therapeutic communication and feedback with clients. The research method used is the research and development method. The validation test was conducted by expert judgment, namely the lecturer in charge of the contraceptive implant installation practical course. This stage aims to ensure that the teaching aids are suitable for use by practitioners using questionnaire and interview instruments. The validation results show that the silicone model arm teaching aid is suitable for use. Subsequently, a trial was conducted by practitioners, and the results indicated that the design of the teaching aid arm is in accordance with the anatomy of the human inner arm, the teaching aid arm allows for easy insertion of the implant tube, the teaching aid arm is comfortable when used as a costume, and the teaching aid arm is easy to use and functions well. The perception test results indicated that the silicone model arm teaching aid is in line with the learning materials and objectives and can enhance interest, thinking skills, and the desire to learn more in the contraceptive implant installation practicum.

Keyword: *The teaching aid arm; Silicone; Contraception installation practicum*

To cite this article:

Sari, F.R, Yulianthi, Destriani, N.P & Sulung, N. (2025). Silicone Demonstration Arm Costume Model For Improving Implant Contraceptive Practice Skills. *JKTP: Jurnal Kajian Teknologi Pendidikan*, 8(2), 170–179. doi: [10.17977/um038v8i22025p170](https://doi.org/10.17977/um038v8i22025p170)

INTRODUCTION

Maternal Mortality Rate (MMR) in Indonesia remains a major public health issue and is still far from achieving the global SDGs targets. According to the 2017 Indonesia Demographic and Health Survey (IDHS), the Neonatal Mortality Rate (NMR) was 15 per 1,000 live births, with a national target of 10 per 1,000 live births by 2024. The Infant Mortality Rate (IMR) was recorded at 24 per 1,000 live births, with a target of 16 per 1,000 live births by 2024. Globally, the 2030 targets for MMR, IMR, and NMR are 70 per 100,000 live births, 12 per 1,000 live births, and 7 per 1,000 live births, respectively. One of the efforts to reduce maternal mortality is the strengthening of the Safe Motherhood initiative, with its first pillar being contraceptive services and Family Planning (FP). To improve the quality of FP services, it is essential to implement standardization to address issues in service quality related to the availability and distribution of health facilities providing FP services, the availability of competent health professionals, and the ability of midwives to provide comprehensive explanations about contraceptive methods, including side effects, management, complications, and failures (Directorate of Family Health, 2021).

The use of contraception aims to fulfill every individual's reproductive rights, assist in planning the number and timing of children, and prevent unintended pregnancies. Appropriate use of contraceptive devices can also reduce the risk of maternal and infant mortality; therefore, access to and quality of Family Planning programs should be prioritized in healthcare services. Health professionals involved in providing FP services include obstetricians and gynecologists, urologists, general surgeons, general practitioners, midwives, and nurses. In practice, the competencies and authorities of these professionals in delivering FP services are regulated by the government through various regulations (Direktorat Kesehatan Keluarga, 2021).

Professional healthcare providers, particularly in contraceptive device insertion techniques, are crucial to support the Safe Motherhood initiative. These clinical skills must be trained continuously through hands-on practice, either in demonstrations or real patient interactions, as well as through practice using simulation models (Ariningrum & Subandono, 2018). Such clinical competencies are developed through practicum-based learning supported by appropriate learning media. Educational media can create measurable and assessable learning environments. The integration of technology in learning media provides tools for monitoring student progress in greater detail (Laksana, 2024). Media used in learning activities help visualize and deliver complex, abstract, or broad concepts in more engaging and accessible ways (Hapsari et al., 2021). An implant insertion simulation model serves as a training tool for health students to become skilled and competent in the insertion and removal of subdermal contraceptive implants (AKBK). Improper insertion may lead to complications, such as the implant being placed too proximally, where the implant tip may exert pressure on nerves or penetrate the coracobrachialis muscle (Ramdhan et al., 2018).

Currently, many phantom models used in implant insertion labs are damaged due to overuse and an imbalance between the number of tools and users, reducing their functional capacity. The use of anesthetic agents, a critical component of the practicum, also contributes to the moisture and peeling of the phantom's surface. Numerous implant insertion phantoms are commercially available, each with varying quality and pricing. Typically, these commercial phantoms consist of arm cross-sections mounted on acrylic bases, with high-grade silicone skin models being particularly expensive.

Modified tools that resemble actual clinical instruments or mannequins are highly beneficial for students in developing independent skills (Patmawati & Hidayati, 2020). Previous research has

developed ultrasound phantoms using materials such as gelatin, agar, paraffin gel, and silicone rubber. Gelatin- and agar-based phantoms are not durable and unsuitable for long-term use, and gelatin-based phantoms require refrigeration during preparation (Morrow et al., 2016). Paraffin gel-based phantoms face challenges in altering acoustic velocity within the material (Vieira et al., 2013). In contrast, silicone rubber-based phantoms are more durable, reusable, and safe (Wang et al., 2014). The homogeneity of silicone rubber-based ultrasound phantoms with catalyst concentrations of 2% and 5% has been analyzed using the Gray Level Co-Occurrence Matrix (GLCM) method (Fatimah et al., 2018).

In this study, the training arm model is designed using silicone material to realistically simulate human skin with several layers resembling upper arm anatomy. This arm model is also costume-based so that it can be worn by students acting as patients/FP clients, allowing practitioners to practice patient positioning as in real clinical conditions. Additionally, the wearable model helps students train in communication skills and provide immediate feedback in response to patient complaints. This aligns with the educational perspective that success in achieving learning objectives depends not only on intellectual intelligence but also on emotional and spiritual intelligence (Putra et al., 2022).

METHOD

The research method employed in this study is research and development (R&D). This method is used to produce a specific product and evaluate its effectiveness (Saputro, 2017). The stages of the research include research and information collecting, which involves literature review and assessing the urgent need for an appropriate training model. Most of the implant insertion training models (phantoms) used in midwifery laboratory practice were found to be damaged, primarily due to frequent use and an imbalanced ratio of tools to users. The use of anesthetics, an essential part of the practicum, also contributes to the models becoming moist and peeling easily, thereby compromising their functionality. Consequently, there is a pressing need for a silicone-based phantom with a replaceable outer skin layer to meet the practical needs effectively.

The development stage began with designing a phantom that anatomically resembles the arm of a contraceptive implant acceptor. The mold design was tailored to ensure user comfort when the students wear the arm costume. The outer layer of the phantom was formulated using silicone rubber to provide a realistic texture and facilitate incision and implant insertion during practice. The formulation process was carried out based on sampling tests according to established references. The second layer was made using thick foam, reinforced with elastic rubber bands so it can be worn on the arm like a costume.

The training arm developed in this study is made from RTV (Room Temperature Vulcanized) silicone rubber. A study by Fatimah et al. (2018) described the formulation of phantom materials using silicone rubber with catalyst concentrations of 2% and 5%, based on sample testing. The molds used measured 14.5 cm × 10.5 cm × 4 cm, with Section A made using 320 mL of silicone and 5% catalyst, and Section B with 320 mL of silicone and 2% catalyst. Silicone is a polymer material composed of polysiloxane chains—specifically poly-dimethyl-siloxane with terminal hydroxyl groups (Dabrowska et al., 2016). RTV silicone rubber is available in various levels of hardness, from very soft to medium, and requires the addition of a catalyst for the curing process. The type of catalyst used in this research was Bluesil Catalyst 60R, a transparent agent. The softness of the RTV silicone rubber used is rated at 16.8 on the Shore A durometer scale (Setiawan et al., 2017).

A validation test was conducted prior to user trials involving students and lecturers. The training arm needed to achieve a status of "valid" or "highly valid" before it could be tested

further. Once developed, the model was assessed by expert judges, specifically lecturers responsible for the contraceptive implant practicum.

Following validation, the user trials of the training arm were conducted and analyzed using structured questionnaires. These forms were distributed to both students and lecturers. The evaluation employed a Likert scale, with the following scoring: Strongly Agree (SS/4), Agree (S/3), Neutral (TAP/2), Disagree (TS/1), and Strongly Disagree (STS/0), as illustrated in the table below:

Table 1. Validation Test of Silicone Demonstration Arm Costume Model for Implant Installation Practice

Item	Score				
	SS	S	TAP	TS	STS
Design					
Function					
Tool Efficiency					
Tool Durability					
Ergonomics (Tool comfort and safety)					
Technical components					
Suitability to Learning Objectives and Materials					
Increase interest, thinking skills, and desire to learn further					

The data analysis techniques used in this study consist of both quantitative and qualitative analysis. The results of the assessments are utilized to measure the validity of the product based on percentage criteria, following the validation scoring standards as described below:

Table 2. Validity Criteria

Percentage (%)	Validity Level	Description
90-100	Highly Valid	Very suitable for use, no revisions needed
75-89	Valid	Suitable for use, no revisions or only minor revisions needed
60-74	Moderately Valid	Fairly suitable for use, requires major revisions
55-59	Less Valid	Less suitable for use
0-54	Not Valid	Not suitable for use

RESULT

The research on a wearable silicone arm phantom for contraceptive implant practicum began with the following stages: The initial stage of this study was research and information collection, which included a literature review and assessment of the essential need for a training aid. The training aid in question—a phantom used in contraceptive implant practicums at the midwifery laboratory—was found to be largely damaged due to frequent use and an insufficient equipment-to-student ratio. Additionally, the use of anesthetics during the practicum contributed to the phantom's surface becoming damp and easily peeled, thereby diminishing its functionality. Therefore, a silicone phantom with an appropriate formulation is required, particularly one with a replaceable outer skin layer to suit practicum needs.

The development phase began by designing a phantom based on the anatomical structure of a contraceptive implant acceptor's upper arm. The mold was created to ensure comfort for students wearing the arm costume. The outer skin formulation was made using silicone rubber, which appeared realistic and facilitated the students' ability to perform incisions and implant tube

insertions. The silicone arm was created through sample testing based on referenced formulations. A second inner layer was constructed using thick foam and reinforced with an elastic band, allowing the phantom to be worn on the user's arm like a costume. In this study, the resulting skin thickness levels were analyzed, and the findings are illustrated in the following chart 1:



Chart 1. Artificial Epidermis Experiment Data

Based on the graph data presented above (chart 1), the final measured skin thickness was found to be 0.07 and 0.08 mm, which corresponds to the anatomical thickness of the human epidermis layer, ranging between 75–150 μm (Wahyuningsih & Kusmiyati, 2017). Once the silicone skin layer was successfully formulated to resemble the human anatomy, it was integrated into a wearable costume by sewing it with elastic bands—taking into account the comfort and safety of the users. The result showed a feasibility score of 79.2%, indicating that the wearable silicone arm phantom is considered suitable, comfortable, and safe for use in contraceptive implant practicums.

Table 3. Silicone Sleeve Validation Test Results

Assessment Aspects	Percentage of Results for Each Phase	
	Phase I	Phase II
Design	68,7%	81,3%
Functionality	75 %	81,3%
Tool Efficiency	75 %	81,3%
Tool Durability	75 %	81,3%
Ergonomics (Comfort and Safety of the Tool)	62,5%	75 %
Technical Components	62,5%	81,3%
Alignment with Learning Objectives and Content	81,3%	81,3%
Ability to Enhance Interest, Critical Thinking Skills, and Motivation to Learn Further	75 %	81,3%
Average Score	72,3%	80,5%

The validation phase involved expert judgment from lecturers responsible for the contraceptive implant practicum course. This stage was aimed at ensuring that the training tool is appropriate for student use. Validation was carried out by four lecturers through questionnaire responses and interviews, based on eight assessment aspects. The results of the validation test are presented as table 3.

Based on the final results of the validation test of the Silicone Arm, it can be concluded that the silicone arm teaching aid, designed as a wearable model for implant contraception practicum,

falls into the “highly feasible” category, with an average score of 80.5%. However, some improvements are recommended based on interviews with validators, particularly regarding the inner arm foam and the costume design.



Figure 1. Thickness of the Artificial Epidermal Layer of Experiments (1), (2) and (3)

After the tool was deemed suitable for use, a trial phase was conducted involving 30 fifth-semester students who had already completed the implant insertion practicum course. The results of the trial are presented as table 4.

Table 4. Trial Results (Perception Test) of the Silicone Arm by Students

Assessment Aspects	Percentage of Results for Each Phase
Design	79,2%
Functionality	80%
Tool Efficiency	79,2%
Tool Durability	80,8%
Ergonomics (Comfort and Safety of the Tool)	79,2%
Technical Components	79,2%
Alignment with Learning Objectives and Content	80%
Ability to Enhance Interest, Critical Thinking Skills, and Motivation to Learn Further	78,3%
Average Score	79,5%

Based on the results of the trial (perception test) using questionnaires distributed to students, 79.5% stated that the silicone arm model is highly feasible to be used as a training aid for contraceptive implant insertion practicum. Additionally, interview results revealed that students felt significantly assisted by the costume-style model, as it not only trained them in properly positioning the arm but also in practicing therapeutic communication with patients. The silicone skin was easy to incise, and the implant tubes could be easily inserted beneath the skin, thereby facilitating the implant removal process.



Figure 2. Implant Contraceptive Installation Practice

DISCUSSION

This study aims to develop an implant insertion simulation model in the form of a wearable silicone arm that trains students in positioning patients, performing therapeutic communication, and providing direct feedback. This training arm also serves as an implementation of theoretical concepts taught in the Women's Health and Family Planning course. The problem analysis phase began with interviews to assess the need for such a simulation tool, involving both lecturers and students. The interviews revealed key problems: students were unable to properly position the patient's arm, which should be well-supported and either straight or slightly bent for a comfortable and accurate insertion. The standard phantom used in practical sessions only includes the upper arm (a half-phantom), limiting its functionality. Additionally, the silicone skin used in current phantoms tends to tear easily and lacks elasticity. Students also have limited opportunities to practice therapeutic communication and receive immediate feedback. Most phantoms used in contraceptive implant practicum sessions in midwifery laboratories are damaged due to high usage and an inadequate student-to-tool ratio. The use of anesthetics during practical sessions further causes the phantom skin to become damp and peel easily, limiting its functionality. Therefore, there is a strong need for a silicone-based phantom with an appropriate formulation, especially with an outer skin layer that can be replaced based on practical requirements.

The next stage involved designing a phantom that matches the anatomical structure of a contraceptive implant client's upper arm. The mold was crafted to ensure student comfort while wearing the arm as a costume. The outer skin layer was formulated using silicone rubber to provide a realistic texture and facilitate incision and implant insertion. The silicone arm was produced through sample testing based on referenced procedures. The second layer was made from thick foam and equipped with an elastic strap, allowing it to be worn as a costume. The developed phantom was validated by subject matter experts, specifically lecturers who teach the implant insertion practicum, using eight assessment aspects. This stage ensured that the simulation tool is suitable for use in practical sessions. Validation was carried out by four lecturers through questionnaires and interviews. Evaluation aspects included design, function, durability, alignment with learning objectives and materials, and the ability to enhance interest, thinking skills, and motivation to learn. The results from the four expert validators indicated an average score of 81.3%, categorized as valid or good. Interviews provided additional input regarding ergonomic aspects, suggesting the use of thicker materials that remain comfortable and safe, and adjustments to the color to better represent human skin.

After the tool was revised and deemed appropriate for use, the next step was product testing. The trial involved 30 fifth-semester students, with 80% stating that the costume model arm aligns with learning objectives and improves procedural thinking skills for implant insertion and removal. Interviews confirmed that the costume-style arm was highly beneficial in helping students practice patient positioning and therapeutic communication. The silicone skin was easy to incise, and the implant tube was easily inserted under the skin, simplifying removal procedures.

The integration of knowledge and skills related to contraceptive implant insertion must be well mastered by students before clinical placements to minimize complications and trauma for patients. Mistakes in implant procedures can result in deep insertions that are difficult to palpate, increasing the risk of neurological or vascular damage, implant migration, or intravascular insertion. Inadequate simulation tools hinder students from achieving full competence (Susilawati et al., 2023).

This study offers an innovation in the development of a wearable silicone phantom for implant insertion. Commercially produced phantoms have both advantages and drawbacks.

Affordable models often use silicone material that becomes damp, hindering accurate subdermal insertion, and the replacement skin layer is typically thin and non-elastic, making it prone to tearing. On the other hand, imported phantoms offer better skin elasticity and ease of use but come at a significantly higher cost. To meet equipment demands and improve the student-to-tool ratio, this study introduces a wearable silicone arm modeled after actual anatomical structure, offering appropriate skin texture and thickness. Properly designed simulation tools help increase students' cognitive engagement and provide efficiency in learning (Aminatul Fitri et al., 2021).

Previous studies on skin construction indicated that different stiffness levels in silicone materials can be used to mimic the epidermis, dermis, subcutaneous fat, muscles, and superficial veins. Tests on phantom flexibility and insertion characteristics revealed stiffness levels up to four times higher than those observed in previous in-vivo studies (Engers et al., 2020). This study achieved skin thickness levels of 0.07 and 0.08 mm, which correspond to the anatomical thickness of the human epidermis (75–150 μm) (Wahyuningsih & Kusmiyati, 2017). Once the desired silicone skin thickness was achieved, the skin was combined into a costume using additional fabric and thick foam materials.

Based on the results, 80% of students stated that the wearable silicone arm functioned well in practical use. Interviews revealed that this innovation helped students practice patient positioning and provided opportunities for direct communication feedback. Compared to previous phantoms, the wearable model offered more elastic skin, allowing easier insertion of implant tubes beneath the surface, thereby making the training process more effective and realistic. These findings are consistent with those of Kartikasari et al. (2025), who reported that their silicone skin sheets allowed for 5–10 incisions without tearing. Another study using e-books and augmented reality for implant training showed significant improvement in students' knowledge and skills before and after using these tools (Susilawati et al., 2023). Additional studies on innovative training tools, such as those by Lindayani et al. (2020) and Suarniti (2023), validated the use of intrauterine device (IUD) insertion training tools and demonstrated that custom-developed tools were as effective as commercial models.

The wearable silicone arm also increased students' interest, critical thinking, and motivation to pursue further learning, with a score of 78.3%. This supports Rozana et al. (2022), who stated that well-designed learning media can enhance engagement and encourage student interaction with their learning environment. Tool development that considers appropriate material selection, proper techniques, and user-friendly operation significantly contributes to participants' motivation during practical learning sessions (Rahmani et al., 2022).

CONCLUSION

The wearable silicone arm model has met the criteria for validity and is suitable for use in the practicum of contraceptive implant insertion and removal. Student trial (perception) results indicate that the silicone arm utilizes soft and elastic materials, which facilitate the insertion of the implant rod. Its efficiency, durability, functionality, and ergonomic design significantly support the practicum process—especially when compared to commercially manufactured phantoms, which are rigid and prone to tearing. The training arm also aligns well with the learning objectives and materials, while enhancing students' interest, critical thinking skills, and motivation for further learning. Based on these findings, future researchers are encouraged to further develop this innovation with more aesthetically refined designs that more closely resemble human anatomy.

REFERENCES

Akhmad nurokim. (2021). *Anatomi Kulit*. <https://Informasains.Com/Edu/Post/2021/02/Kulit-Pengertian-Anatomi-Dan-Fungsi/>.

- Ariningrum, D., & Subandono, J. (2018). Buku Pedoman Keterampilan Klinis Pemasangan infus. Fakultas Kedokteran Universitas Sebelas Maret Surakarta 2018, 1–36.
- Aminatul Fitri, Mulia, P., & Febriyanti, E. (2021). Pengembangan Media Pembelajaran Alternatif Phantom Injeksi Modifikasi Pada Kegiatan Praktikum di Laboratorium Keperawatan. *Health Care : Jurnal Kesehatan*, 10(1), 8–14. <https://doi.org/10.36763/healthcare.v10i1.109>
- Direktorat Kesehatan Keluarga. (2021). Pedoman Pelayanan Kontrasepsi dan Keluarga Berencana. In Direktorat Kesehatan Keluarga, Kementerian Kesehatan Republik Indonesia (Vol. 1, Issue November).
- Hapsari, D., Wedi, A., & Sulthoni, S. (2021). Pengembangan Game Labu Siswa Kelas VII. *JKTP: Jurnal Kajian Teknologi Pendidikan*, 4(3), 242–250. <https://doi.org/10.17977/um038v4i32021p242>
- Kartikasari, D., Latumahina, R. G., Kebidanan, J., Sorong, P. K., Sorong, K., & Daya, P. B. (2025). Uji kelayakan phantom lengan untuk pemasangan KB Implan Di laboratorium Poltekkes Kemenkes Sorong. 9(1), 105–114.
- Laksana, D. N. L. (2024). Pengembangan Media Pembelajaran Literasi Dan Numerasi Berbasis Budaya Lokal Untuk Siswa SD Kelas Rendah. *JKTP: Jurnal Kajian Teknologi Pendidikan*, 7(1), 012. <https://doi.org/10.17977/um038v7i12024p012>
- Putra, B. S., Soepriyanto, Y., & Susilaningsih. (2022). Novel Chat Sebagai Inovasi Media Pembelajaran Sosiologi Materi Bentuk Interaksi Sosial. *JKTP: Jurnal Kajian Teknologi Pendidikan*, 5(1), 42–51. <https://doi.org/10.17977/um038v5i12022p042>
- Suarniti, N. W. (2023). Pengembangan Alat Peraga Low Technology Dan High Fidelity Dalam Praktik Pemasangan Alat Kontrasepsi Dalam Rahim. *Malang Journal of Midwifery*, 5(2), 108–117.
- Dabrowska, A. K., Rotaru, G. M., Derler, S., Spano, F., Camenzind, M., Annaheim, S., Stämpfli, R., Schmid, M., & Rossi, R. M. (2016). Materials used to simulate physical properties of human skin. *Skin Research and Technology*, 22(1), 3–14. <https://doi.org/10.1111/srt.12235>
- Engers, M., Stewart, K. W., Liu, J., & Pott, P. P. (2020). Development of a realistic venepuncture phantom. *Current Directions in Biomedical Engineering*, 6(3). <https://doi.org/10.1515/cdbme-2020-3104>
- Fatimah, S., Maslebu, G., Trihandaru, S., & Alamat, □. (2018). Analisis Homogenitas Citra Ultrasonografi Berbasis Silicone Rubber Phantom dengan GLCM. *Jurnal Fisika*, 8(1), 18–27.
- Lindayani, K., Wayan Suarniti, N., Gusti Agung Ayu Novya Dewi, I., Made Dwi Mahayati, N., Kemenkes Denpasar, P., & Artikel, R. (2020). uji validitas alat peraga pemasangan ALat Kontrasepsi Dalam Rahim (AKDR). *Jurnal IMJ: Indonesia Midwifery Journal*, 4.
- Mayo Clinic. (2023). Contraceptive implants. <https://www.mayoclinic.org/Tests-Procedures/Contraceptive-Implant/about/Pac-20393619>.
- Morrow, D. S., Broder, J. S., & Cupp, J. A. (2016). Versatile, Reusable, and Inexpensive Ultrasound Phantom Procedural Trainers. *Journal of Ultrasound in Medicine: Official Journal of the American Institute of Ultrasound in Medicine*.
- Novita. (2020). Teknik Pemasangan Implan KB. <https://www.alomedika.com/tindakan-medis/obstetrik-dan-ginekologi/pemasangan-implan-kb/teknik>.
- Patmawati, P., & Hidayati, F. (2020). Pemanfaatan Sampah Bahan Habis Pakai Non-Medis Laboratorium Ketrampilan Klinik (SKILLS LAB) Sebagai Modifikasi Alat Peraga Sederhana Skill Mandiri. *Jurnal Pengelolaan Laboratorium Pendidikan*, 2(2), 73–79. <https://doi.org/10.14710/jplp.2.2.73-79>

- Rahmani, Y., Hamdani, D., & Risdianto, E. (2022). Pengembangan Alat Peraga Eksperimen Fisika Dasar I Pada Materi Viskositas Fluida. *Amplitudo: Jurnal Ilmu Pembelajaran Fisika*.
- Ramdhan, R. C., Simonds, E., Wilson, C., Loukas, M., Oskouian, R. J., & Tubbs, R. S. (2018). Complications of Subcutaneous Contraception: A Review. *Cureus*. <https://doi.org/10.7759/cureus.2132>
- Rozana, S., Widya, R., & Tasril, V. (2022). *Multimedia Pendidikan Kesehatan dan Nutrisi*. Jejak Pustaka.
- Saputro, B. (2017). *Manajemen Penelitian Pengembangan (Research&Development) Bagi Penyusun Tesis dan Disertasi*. Aswaja Pressindo. <https://books.google.co.id/books?id=O2nsDwAAQBAJ>
- Setiawan, J., Prasetyo, A., & Besar Kerajinan dan Batik, B. (2017). Pengaruh Penambahan Talc Terhadap Peningkatan Nilai Kekerasan Cetakan Rtv Silicone Rubber Pada Proses Spin Casting Effect of Talc Addition on RTV Silicone Rubber Mold Hardness Value Increasing in Spin Casting Process. *Dinamika Kerajinan Dan Batik*, 1, 1–10.
- Susilawati, E., Sari, L. A., Nugraheni, D. E., & Pulungan, V. (2023). Media Pembelajaran Pemasangan Kontrasepsi Implan terhadap Pengetahuan dan Keterampilan Mahasiswa Kebidanan. *Journal of Telenursing (JOTING)*, 5(2), 3181–3189. <https://doi.org/10.31539/joting.v5i2.7875>
- Vieira, S. L., Pavan, T. Z., Junior, J. E., & Carneiro, A. A. (2013). Paraffin-gel tissue-mimicking material for ultrasound-guided needle biopsy phantom. *Ultrasound in Medicine & Biology*,.
- Wahyuningsih, P., & Kusmiyati, Y. (2017). *Bahan Ajar Kebidanan Anatomi dan Fisiologi (Kemenkes RI)*. Kemenkes RI.
- Wang, Y., Tai, B. L., Yu, H., & Shih, A. J. (2014). Silicone-Based Tissue-Mimicking Phantom for Needle Insertion Simulation. *ASME. J. Med. Devices*