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# Development of SAC Media Integrated with Project Based Learning Model on Reaction Rate Material

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***Abstract***: *This research aims to determine the analysis of the feasibility level and response of students to SAC (Smart Apps Creator) media integrated with project based learning on reactionrate material. The research method used is Research and Development with a 4D development model approach (define, design, development and disseminate). Research data collection is carried out by interviews and questionnaires or questionnaires that are distributed to teachers and students.This research was conducted at SMAS PAB 8 Saentis. The population and samples in this study are chemistry lecturers, teachers and students of grade XI 2 for the 2023/2024 academic year taken by purposive sampling of 30 people. Based on validity, it shows that the SAC learning media developedwas declared valid by validators with the criteria of "Very Feasible" with an average validation score of 89.86%, then based on the results of student responses, it was obtained that the SAC learning media developed as a whole received an average percentage result of 83.81% with the criteria of "Strongly Agree". Therefore, SAC learning media integrated with the project-based learning model on the reaction rate material is suitable for use as a learning medium.*

***Keywords***: *Learning Media; SAC; Project Based Learning*

## INTRODUCTION

Technological developments directly require the world of education to adapt to these developments in improving the quality of education so that it can create quality human resources (Husniyah & Asrizal, 2023). The development of 21st century technology has had a major impact on the world of education, especially changes in learning paradigms which are influenced by developments in technology, media and curriculum (Nafisah & Ghofur, 2020).

Learning in the 21st century requires utilizing various innovations in technology. A teacher's ability is not only to develop pedagogical abilities in learning, but teachers must also have skills in using technology so that learning is in line with developments in the 4.0 era (Hapsari & Fahmi, 2021)Skills in this technology are to improve learning outcomes and facilitate the process and availability of learning tools (Azizah et al., 2020). Integrating subject matter knowledge and technology has existed since the increasing need for students to use and need to learn with technology (Yurinda & Widyasari,

2022). Teachers must master knowledge of subject matter, pedagogy and technology so that the integration of technology-based learning can be delivered well. These three tools interact with each other and form Technological Pedagogical Content Knowledge (TPACK) (Suyamto et al., 2020).

TPACK is the knowledge needed so that a teacher can use appropriate technology, which is based on analysis of the character of the material and analysis of pedagogical aspects. TPACK requires unique multiple interactions and synergy between material, pedagogy and technology. TPACK indicates that content knowledge integrates technology and skills. Pedagogy is an important condition in creating effective and innovative classroom teaching using technology (Sholihah et al., 2016). Educators' ability to use technology is one solution for preparing a competent millennial generation (Somantri, 2021)

Android-based learning media use is one application of 21$^{st}$ century learning styles. The use of this type of learning media has the potential to help improve students' academic performance in the form of learning outcomes in the cognitive domain (Elviana & Julianto, 2022). In addition, the advantages of digital learning in supporting the implementation of the learning process increase students' ability to absorb and understand the learning context, encourage learning independence, increase student active participation and the ability to display information using technical devices in learning (Sutiani et al., 2022). One application that can be used to create learning media is SAC (Smart Apps Creator). SAC (Smart Apps Creator) is software that can be used to create mobile, desktop and website-based multimedia features. SAC is an application that can be used to create Android and iOS mobile applications, making it easier for students to open learning resources and smartphones. SAC learning media will make the learning material delivered more interesting because there are explanations of the material, videos or photos supporting the material and interesting quizzes from the learning materials so that active, effective and independent learning will be created and is expected to overcome students' boredom in the learning process (Pramesti et al., 2023).

Kinetic energy is defined as the energy available due to the motion of an object, kinetics refers to the reaction rate, which is the change in the concentration of reactants or products over time (M/s) (Sayani & Sutiani, 2020). Reaction Rates is one of the abstract materials in chemistry learning. This can be seen from the results of research conducted by (Alhayat et al., 2022) showing that students have difficulty understanding how the reaction rate changes during the reaction, and students are unable to provide an appropriate explanation regarding the relationship between reaction rate and reaction time both in writing (symbolically). or graphic) or verbally. In the study, (Silaban & Sianturi, 2021) also mentioned that in studying the reaction rate material, students are required to understand the concept of reaction rate in the form of lectures, but students are more interested in understanding the concept if it is packaged in an interesting form.

Based on interviews conducted by researchers at SMAS PAB 8 SAENTIS, student learning outcomes were still in the low category, while students who had not yet reached the KKM were 60% with a chemistry KKM score of 80. The use of the learning model did not involve students in learning. Apart from that, the use of media in the learning process is still less than optimal. The learning media used is still less creative and less suited to students' needs in understanding abstract chemical concepts, making students feel bored and not interested when taking part in learning. Based on the background above, researchers are interested in carrying out development research entitled "Development of Integrated SAC (SMart Apps Creator) Media Project Based Learning Models on Reaction Rate Material.

## LITERATURE REVIEW

Education is very important in determining the quality of a nation's human resources, and is also an aspect that must be

prioritized in a country's growth. Good education must be able to shape a person's knowledge and abilities. Education must lead to the formation of students to be able to build knowledge, capacity, develop high-level thinking skills, such as critical thinking, making decisions, and solving problems (Sutiani & Pasaribu, 2023).

Generic skills can be grown when students go through the process of learning chemistry, one of which is to learn various concepts and solve various scientific problems. In learning chemistry, one of which is the material on the Reaction Rate, it is very necessary to develop generic science skills (Adri et al., 2020).

The use of Android-based SAC media is considered to be able to increase learning activities to be effective, active (interactive), and increase learning motivation for students in studying material. This is in line with research by (Kurniawan & Tanjung, 2022) which states that the use of SAC media as an Android-based learning medium is effective in improving learning outcomes and getting positive responses from students.

The Project Based Learning (PjBL) learning model is a project learning model or real activity as the core of learning (Ramadan & Arfinanti, 2019). Based on research conducted by (Mayangsari, 2017) it is revealed that students' learning outcomes in the cognitive domain have increased because they use the PjBL learning model so that this learning model is effective for learning because students are not limited in searching for information, which is the main capital so that students can improve learning outcomes in the cognitive domain. The project-based learning model is one of the recommended learning models. By integrating a project-based learning model of syntax and experimental activities in this case this module can help teachers in the learning process (Purba & Sembiring, 2023).

One of the competencies that students who are preparing to become science teachers at school after studying chemistry must have is being able to apply the topics they have studied to solve relevant problems and adapt chemical concepts to real situations and be able to communicate them in everyday life learning in the school environment. class. Therefore, students must master critical thinking skills and scientific literacy skills to improve their abilities in analyzing, evaluating, synthesizing and determining information that is relevant to daily needs (Sutiani et al., 2021).

Chemistry is included in the family of sciences and is a branch of natural science that includes concepts, rules, laws, principles and theories (Purba et al., 2024). PjBL is now a complementary learning model to the 2013 Curriculum because it is able to provide students with a more interesting and meaningful educational experience (Panggabean et al., 2023).

## METHODS

This research is a type of development research or Research and Development (R&D), which is a research method with planning to create certain items through the development cycle and testing the feasibility of the items (Sugiyono, 2017). The development of learning media in this research refers to the R&D model with 4D instructional design, namely Define, Design, Develop, and Dissemination. The Define stage is the initial stage for establishing learning requirements. This stage is useful for determining needs in the learning process and collecting various information related to the product to be developed. This stage consists of several steps of needs analysis and literature study.

The Design stage aims to design Smart Apps Creator learning media on reaction rate material. This design stage includes media selection, format selection and media draft (storyboard) or initial design of the media to be developed. Then the Development stage, initial product development which begins with preparing the Smart Apps Creator 3.0 software which is used in developing learning media products. The product to be developed

is in accordance with the product design that has been created so that the product developed has a concept in accordance with the initial design. The initial product design was designed using the Canva application and then developed and created based on the application in SAC software. After the product is developed, the feasibility test/validation stage functions to see whether the media is valid or not using the criteria that have been determined.

The feasibility test is carried out by three media experts to assess the new product that is designed based on the criteria that have been set by BSNP. After revising the product based on validation from media experts, then proceed to the Disseminate stage. This stage is a trial stage in small groups (limited test) carried out only at one school, namely SMAS PAB 8 SAENTIS, with the aim of seeing students and teachers regarding the application media that has been developed by researchers. The data obtained in this research is in the form of quantitative and qualitative data. Quantitative data is in the form of research questionnaire answer scores, while qualitative data is in the form of responses and suggestions given by validators, teachers and students regarding the media being developed. Data analysis in this research uses descriptive data analysis techniques using a Likert scale. The Likert scale is used to measure the attitudes, opinions and perceptions of a person or group of people towards a social phenomenon. In this research, a scale of 1 to 4 can be seen in the following table.

**Table 1.** Assessment of student responses

| Percentage | Number | Criteria |
|---|---|---|
| 81% - 100% | 4 | Very Practical |
| 61% - 80% | 3 | Practical |
| 41% - 60% | 2 | Impractical |
| 0% - 40% | 1 | Very Impractical |

## RESULT AND DISCUSSION

This development research is to measure how students respond to the practicality of the learning media developed, the response has six aspects of assessment and the average percentage results which can be seen in the table below.

**Table 2.** Student response assessment results

| Aspect | Information | | |
|---|---|---|---|
| | Persentase | Average (%) | Criterion |
| Material | 82.77 | 83.81 | Very Practical |
| Media | 80.33 | | |
| Display | 86.84 | | |
| Language | 85.83 | | |
| Software | 80.41 | | |
| Media Efficiency | 86.66 | | |

The results of this development research created SAC (Smart Apps Creator) learning media integrated with the Project Based Learning model on Reaction Rate material with the development results in the form of applications. The application is named "KIMIAKU" and is based on Android to help students understand reaction rate material and as a learning media resource that students can access anywhere and anytime when students want to study the material. The appearance of the application developed can make students not feel bored while studying because the appearance is attractive and not monotonous and can be accessed offline or without having to be connected to the internet. The KIMIAKU application product in this research displays the main material of reaction rates which is presented in the application consisting of several subchapters, namely the concept of reaction rates, rate laws, reaction mechanisms and reaction rate factors.

The learning model used is integrated Project Based Learning where the learning process is combined with practicum. A series of processes in presenting reaction ratematerial based on project based learning models are displayed using pictures, learning videos from YouTube, LKPD, chemical equations or notation and text. The application also contains learning objectives, learning indicators, quizzes, evaluation tests, initial ability tests, concept maps, editor profiles, bibliography, and how to use the application. The purpose of using this application product is as a necessity in learning and this learning media is suitable for assisting learning activities (Novitasari & Suhartono, 2023).

Products that have been developed in accordance with the product design that has

been created will go through the validation stage, product validation will only be carried out by media experts. The following are the results of the media expert validator's assessment.

**Table 3.** Media expert validation results

| Aspects | Validators | | | Average (%) |
|---|---|---|---|---|
| | Lecturer 1 | Lecturer 2 | Lecturer 3 | |
| Linguistic (%) | 100.00 | 75.00 | 93.75 | 89.58 |
| Software engineering (%) | 95.00 | 75.00 | 100.00 | 90.00 |
| Visualization (%) | 85.00 | 75.00 | 100.00 | 90.00 |
| Overall Average (%) | | | | 89.96 |
| Criteria | | Strongly Agree | | |

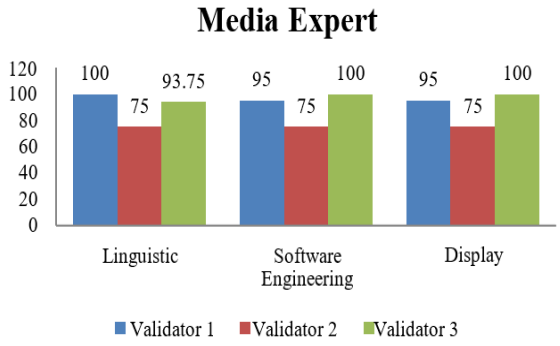


**Figure 1.** The percentage results from the validators

Based on the results of the table above, it shows that the validation of media experts is divided into three aspects, namely linguistic aspects, software engineering aspects and visualization aspects using a Likert scale. The data obtained is then managed with the percentage results of each validator. The percentage results from the three validators regarding the linguistic aspect were 89.58%, the software engineering aspect was 90% and the display aspect was 90%. The average value of the three assessment aspects is 89.86% with the result criteria being "Strongly Agree".

The blue color is the assessment from validator 1 with the linguistic aspect being given a score of 100.00%, the software engineering aspect 95.00% and the display aspect 95.00%. Then the red color is the assessment from validator 2 with the linguistic aspect being given a score of 75.00%, the software engineering aspect being 75.00% and the display aspect being 75.00%. The last diagram, namely green, is an assessment from validator 3 with the linguistic aspect being given a score of 93.75%, the software engineering aspect 100.00% and the display aspect 100.00%. The results above show that the media developed is suitable for use as a learning medium, this is in line with previous research, namely that the media validation result received a score of 4.3 on a scale of 5 with the predicate of good feasibility and practically (Hidayah et al., 2023).

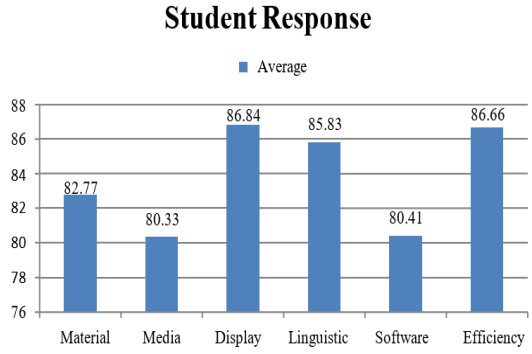


**Figure 2.** The percentage results student response

Based on data from filling out the response questionnaire, students' responses on a small/limited scale to the KIMIAKU application, there are 30 students in class XI 2 SMAS PAB 8 SAENTIS with an assessment percentage of 82.77%, the media aspect with a presentation assessment of 80.33%, the display aspect with a percentage of 85.83%, the software aspect with an assessment percentage of 80.41%, and the media efficiency aspect with an assessment percentage of 86.66%. The average value of the student response results with the six assessment aspects is 83.81% in the "very practical" category. This result shows that students responded to the application product being developed as very practical for use as a learning medium. This can be seen from the practicality score percentage below which shows a percentage of >81% indicating the very practical category. This is in line with previous research that the Android-based learning media assisted by SAC that has been developed is valid and

practical so it is suitable for use with a practicality percentage of 94% (Tristanti & Iffah, 2022).

## CONCLUSION

The results of the media expert's validation of the KIMIAKU application as a learning media on reaction rate material with a Project Based Learning based learning model meet the valid criteria or are suitable for use as a learning media. This is based on the feasibility assessment in terms of assessment aspects from media experts with a percentage of 89.86%, so the media as a whole is included in the "very feasible" category. This result shows that the media developed is very suitable for use as a learning medium and helps in the learning process of participants educate. The response of students to the learning media in the form of the KIMIAKU application based on several aspects and as a whole is included in the "very practical" criteria, with a percentage result of 83.81%, this result shows that the discovery of the KIMIAKU application has an influence on students in the chemistry learning process where the results state that students think the KIMIAKU application is very practical as a learning medium. This is in line with the research of Mahmuda et al (2021) with the results of a recapitulation of the response assessment to the level of practicality of SAC products developed by 88.08%, meaning that students think that the product is very practical to be used as a learning medium. Researchers really hope that the results of the development of Smart Apps Creator (SAC) media in the form of the KIMIAKU application on reaction rate material based on the Project Based Learning learning model can be used in the learning process in schools to be more optimal, useful and can increase student interest in learning. It is hoped that the KIMIAKU application as a learning medium developed this time can be redeveloped by further improving the practicality of the media and in a more attractive design, not only on reaction rate material but on other chemical materials whose learning models are different as well and can be applied and used as a reference for future researchers.

## REFERENCE

Adri, H. T., Yudianto, S. A., Mawardini, A., & Sesrita, A. (2020). Using Animated Video Based on Scientific Approach To Improve Students Higher Order Thingking Skill. *Indonesian Journal of Social Research (IJSR)*, *2*(1), 9–17. https://doi.org/https://doi.org/10.30997/ijsr.v2i1.23

Alhayat, A., Masriani, M., Rasmawan, R., Hairida, H., & Erlina, E. (2022). Profil Kemampuan Mahasiswa Pendidikan Kimia dalam Menyelesaikan Masalah Kontekstual Kimia. *Edukatif : Jurnal Ilmu Pendidikan*, *4*(3), 4694–4705. https://doi.org/10.31004/edukatif.v4i3.2743

Azizah, D. S., Putri, D. A., & Mulhayatiah, D. (2020). Prospective Science Teacher TPACK Skills in Preparing the Lesson Plans. *Jurnal Geliga Sains: Jurnal Pendidikan Fisika*, *8*(2), 132–139. https://doi.org/10.31258/jgs.8.2.132-139

Elviana, D., & Julianto, J. (2022). Pengembangan Media Smart Apps Creator (SAC) Berbasis Android Pada Materi Suhu Dan Kalor Mata Pelajaran IPA Kelas V Sekolah Dasar. *Jurnal Pendidikan Guru Sekolah Dasar*, *10*(4), 746–760.

Hapsari, D. I. S., & Fahmi, S. (2021). Pengembangan Media Pembelajaran Interaktif Berbasis Android Pada Operasi Pada Matriks. *FIBONACCI: Jurnal Pendidikan Matematika Dan Matematika*, *7*(1), 51–60. https://doi.org/10.24853/fbc.7.1.51-60

Hidayah, I. K., Rohmaniyah, C., & Fikri, A. A. (2023). Pengembangan Aplikasi Pembelajaran Berbasis Android "APeTriDin" pada Materi Listrik Dinamis. *Jurnal Pendidikandan Pembelajaran Sains Indonesia*, *6*(1),

47–54.

Husniyah, R., & Asrizal, A. (2023). Meta Analisis Pembelajaran Sains Berbasis Teknologi Informasi Untuk Mengembangkan Keterampilan Abad 21 Peserta Didik. *Edu Sains: Jurnal Pendidikan Sains & Matematika*, *11*(1), 1–10. https://doi.org/10.23971/eds.v11i1.3643

Kurniawan, D., & Tanjung, I. F. (2022). Efektivitas Penggunaan Media Pembelajaran SAC Berbasis Android pada Materi Sistem Pencernaan. *Scaffolding: Jurnal Pendidikan Islam Dan Multikulturalisme*, *4*(2), 342–351. https://doi.org/10.37680/scaffolding.v4i2.1619

Mayangsari, S. N. (2017). Peningkatan Hasil Belajar Dengan Model Project Based Learning (Pjbl). *LIKHITAPRAJNA Jurnal Ilmiah*, *19*(2), 33–43. http://jurnal.darmaagung.ac.id/index.php/jurnalpenelitianfisikawan/article/view/321

Nafisah, D., & Ghofur, A. (2020). Pengembangan Media Pembelajaran Scan Barcode Berbasis Android Dalam Pembelajaran IPS. *EduTeach : Jurnal Edukasi Dan Teknologi Pembelajaran*, *1*(2), 144–152. https://doi.org/10.37859/eduteach.v1i2.1985

Novitasari, I., & Suhartono, S. (2023). Pengaruh Model Pembelajaran Project Based Learning (PjBL), Konvensional, Dan Perhatian Orang Tua Terhadap Hasil Belajar Peserta Didik Kelas II SDN Tandes Kidul I/110 Surabaya. *JPD : Jurnal Pendidikan Dasar*, *12*(1), 103–109. https://doi.org/https://doi.org/10.21009/JPD.012.09

Panggabean, F. T. M., Silitonga, P. M., Sutiani, A., Purba, J., & Gultom, R. (2023). Inquiry Based Learning STEM Teaching Materials to Improve Students' Thinking Skills in Stoichiometry. *JTK (Jurnal Tadris Kimiya)*, *8*(2), 157–164. https://doi.org/10.15575/jtk.v8i2.28870

Pramesti, A. C., Mashabi, N. A., & Mulyati, M. (2023). Pengembangan Media Pembelajaran Teknik Pembuatan Minuman Berbasis Smart Apps Creator (SAC) Pada Mata Kuliah Bartending. *Jurnal Teknologi Pembelajaran Indonesia*, *13*(1), 44–55. https://doi.org/https://doi.org/10.23887/jurnal_tp.v13i1.1623

Purba, J., Panggabean, F. T. M., Sutiani, A., & Gultom, R. (2024). Development of PjBL STEM Model to Improve Student's Creative Thinking Ability. *In Proceedings of the 5th International Conference on Innovation in Education, Science, and Culture, ICIESC 2023*, 1–8. https://doi.org/10.4108/eai.24-10-2023.2342336

Purba, J., & Sembiring, B. A. (2023). Development of Project-Based Learning Modules on the Subject of Chemical Equilibrium. *Jurnal Inovasi Pembelajaran Kimia ((Journal of Innovation in Chemistry Education)*, *5*(1), 52–61. https://doi.org/10.33830/cocatalyst.v1i1.4894

Ramadan, F. A., & Arfinanti, N. (2019). Pengembangan Mobile Learning Rensi (Relasi dan Fungsi) Berbasis Android pada Pokok Bahasan Relasi dan Fungsi sebagai Sumber Belajar Mandiri Siswa Kelas VIII SMP. *Jurnal Pengembangan Pembelajaran Matematika (JPPM)*, *1*(1), 42–50. https://doi.org/10.14421/jppm.2019.11.42-50

Sayani, E., & Sutiani, A. (2020). Pengaruh Model Pembelajaran Inkuiri Terbimbing Berbasis Pertanyaan Kritis Terhadap Hasil Belajar Siswa

Materi Laju Reaksi. *Jurnal Inovasi Pembelajaran Kimia (Journal Of Innovation in Chemistry Education)*, *2*(2), 97–103. https://doi.org/10.24114/jipk.v2i2.19742

Sholihah, M., Yuliati, L., & Wartono, W. (2016). Peranan TPACK Terhadap Kemampuan Menyusun Perangkat Pembelajaran Calon Guru Fisika Dalam Pembelajaran Post-Pack. *Jurnal Pendidikan: Teori, Penelitian, Dan Pengembangan*, *1*(2), 144–153.

Silaban, R., & Sianturi, P. A. (2021). Pengembangan Media Pembelajaran Berbasis Android Pada Materi Laju Reaksi. *Jurnal Inovasi Pembelajaran Kimia (Journal Of Innovation in Chemistry Education)*, *3*(2), 191–200. https://doi.org/10.24114/jipk.v3i2.22814

Somantri, D. (2021). Abad 21 Pentingnya Kompetensi Pedagogik Guru. *Equilibrium: Jurnal Penelitian Pendidikan Dan Ekonomi*, *18*(2), 188–195. https://doi.org/10.32832/jpg.v2i1.4099

Sugiyono. (2017). *Metode Penelitian & Pengembangan Reserch and Devolepment*. ALFABETA.

Sutiani, A., Muchtar, Z., Dibyantini, R. E., Sinaga, M., & Purba, J. (2022). Analisis Kemampuan Guru-Guru Kimia SMA Sumatera Utara Dalam Mengintegrasikan TPACK. *Jurnal Inovasi Pembelajaran Kimia (Journal Of Innovation in Chemistry Education)*, *4*(2), 112–131. https://doi.org/10.24114/jipk.v4i2.39259

Sutiani, A., & Pasaribu, C. J. T. (2023). Fostering Scientific Literacy through Integrated STEM Teaching Materials on Basic Laws of Chemistry. *JTK (Jurnal Tadris Kimiya)*, *8*(1), 95–103. https://doi.org/10.15575/jtk.v8i1.25833

Sutiani, A., Situmorang, M., & Silalahi, A. (2021). Implementation of an Inquiry Learning Model with Science Literacy to Improve Student Critical Thinking Skills. *International Journal of Instruction*, *14*(2), 117–138. https://doi.org/10.29333/iji.2021.1428a

Suyamto, J., Masykuri, M., & Sarwanto, S. (2020). Analisis Kemampuan Tpack (Technolgical, Pedagogical, and Content, Knowledge) Guru Biologi SMA Dalam Menyusun Perangkat Pembelajaran Materi Sistem Peredaran Darah. *INKUIRI: Jurnal Pendidikan IPA*, *9*(1), 44–53. https://doi.org/10.20961/inkuiri.v9i1.41381

Tristanti, L. B., & Iffah, J. D. N. (2022). Pengembangan Media Pembelajaran Geometri Ruang Berbasis Android Berbantuan Smart Apps Creator Dalam Meningkatkan Kemampuan Pembuktian. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *11*(3), 1716–1728. https://doi.org/10.24127/ajpm.v11i3.5103

Yurinda, B., & Widyasari, N. (2022). Analisis Technological Pedagogical Content Knowledge (TPACK) Guru Profesional Dalam Pembelajaran Matematika Di Sekolah Dasar. *FIBONACCI: Jurnal Pendidikan Matematika Dan Matematika*, *8*(1), 47–60. https://doi.org/10.24853/fbc.8.1.47-60