

Improving Chemistry Teacher Competence in Compiling Chemistry Learning Modules Oriented to Strengthening Pancasila Student Profiles Assisted by the GPT Chat Application

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Abstract. The community service activity's background stems from observations, interviews, and data collected during Field Experience Practice and Teacher Professional Education mentoring activities for prospective science and chemistry education teachers. It was identified that candidates need enhancement in developing chemistry teaching modules oriented toward the Pancasila Student Profiles (PSP). The activity aims to address this issue by providing competency training in preparing chemistry teaching modules oriented to Pancasila Student Profiles using the GPT Chat application. The target audience for the activity includes chemistry teachers who are members of MGMP Semarang and Kudus, with approximately 25 participants. The activities include training and mentoring through In-House Training, assistance in creating chemistry teaching modules oriented towards Pancasila Student Profiles, and assessment of the developed teaching modules. Based on the data from the community service activity implementation, the following conclusions can be drawn: (1) training participants have increased their competency in compiling chemistry teaching modules oriented towards strengthening the profile of Pancasila students, (2) chemistry teaching modules oriented towards strengthening the profile of Pancasila students have been produced with good and excellent quality, (3) the response of the target audience from the community service activity indicates a positive impact.

Keywords: in house training, pancasila student profile, teaching module

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INTRODUCTION

In the era of Industry 4.0 and Society 5.0, technology is advancing rapidly, and nearly all aspects of life benefit from technological progress. Currently, technological development focuses on Artificial Intelligence (AI). One popular AI is ChatGPT. ChatGPT is a text-based platform with a design similar to messaging applications, allowing users to feel more connected than traditional search engines. The ChatGPT database is also continuously expanding and becoming more comprehensive. Therefore, using the application is highly beneficial in the field of education, including in chemistry teaching and the development of instructional modules (Kim et al., 2022; Smith & Taylor, 2022).

The background of the community service activity (CSA) is based on observations and interviews and supported by data and information gathered during the observation period of the Field

Experience Program (FEP) and the Teacher Professional Education (TPE) for prospective science teachers in junior high schools and chemistry education in senior high schools (Sudarmin, 2023). The observations indicate that there is still an incomplete understanding or tendency for misconceptions among teachers and FEP participants regarding the creation of instructional modules and related components of the Pancasila Student Profile Strengthening Project (P5). Therefore, the issue needs to be addressed and is crucial to address.

The goal of the community service program is to improve and enhance teachers' competence in understanding instructional modules and chemistry teaching materials oriented towards strengthening the Pancasila Student Profile (PSP) with the assistance of the Generative Pre-trained Transformer (ChatGPT) application within the context of the Merdeka Curriculum through an In-House Training (IHT) activity. In the IHT, the ChatGPT application will be introduced as a tool

that can be utilized to guide the development of instructional modules and chemistry teaching materials aimed at reinforcing the Pancasila Student Profile. The IHT activity will be conducted by a community service team from FMIPA, involving teachers and speakers from Mahardika Official.

The IHT activity aims to provide solutions to the competency issues faced by chemistry teachers and prospective chemistry teachers who (a) lack in-depth knowledge and understanding of the ChatGPT application, (b) are not proficient in developing chemistry instructional modules oriented towards the Pancasila Student Profile, and (c) need training in utilizing ChatGPT to develop Pancasila student profile-oriented chemistry instructional modules. The inadequacy of these competencies among chemistry teachers can lead to the failure to achieve the learning objectives related to the Pancasila Student Profile within the Merdeka Curriculum context. The community service initiative seeks to enhance the quality of education.

The Community service requires school and government support to provide adequate resources and infrastructure for each chemistry teacher or prospective chemistry teacher, enabling them to utilize the ChatGPT application after the In-House Training (IHT). The strategic target audience for the activity includes chemistry teachers at SMA 14, 12, and 4 Semarang and science teachers at junior high schools. These locations were chosen because they requested activities and IHT to develop PSP-oriented instructional modules during the Field Experience Program (PPL) mentoring for students (Sudarmin et al., 2023).

Currently, many IT applications are available for preparing and creating IT-based instructional modules, including utilizing ChatGPT (Dai et al., 2021; Johnson & Peterson, 2023). The community service activity aims to help chemistry teachers and prospective chemistry teachers understand what ChatGPT is and how to use it in developing instructional modules related to strengthening the Pancasila Student Profile. Despite some challenges, the urgency and importance of the community service activity stem from the current need to implement the PSP program effectively. Not everyone fully understands PSP, and some chemistry teachers are unsure how to proceed with these activities, leading to a lack of progress. Additionally, instructional modules to strengthen the Pancasila Student Profile are not yet available.

The essence of the community service activity is to assist chemistry teachers in Semarang City in the following ways: (a) Dissemination of expertise from Sudarmin et al. (2021), Kasmui (2022), and experienced chemistry teachers through IHT training and practical guidance in developing PSP-oriented chemistry instructional modules with the help of ChatGPT technology; (b) Structured and measurable training and practice in utilizing ChatGPT for creating PSP-oriented chemistry instructional modules; (c) Technical assistance through IHT and practical sessions on developing PSP-oriented chemistry instructional modules based on ChatGPT technology; and (d) Evaluation and follow-up of the training activities conducted in the community service program.

In the community service activity, solutions are implemented to enhance the competence of chemistry teachers through IHT for developing PSP-oriented instructional modules. The stages of the community service activity include (a) meetings and coordination for preparing tools and materials for developing PSP-oriented chemistry instructional modules; (b) training sessions to provide knowledge on what the ChatGPT application is, its development, and ethical use of ChatGPT; (c) practical sessions for creating PSP-oriented chemistry instructional modules using the ChatGPT application. At the end of the IHT activity, monitoring and evaluation will be conducted regarding developing PSP-oriented chemistry instructional modules and teaching materials created by the chemistry teachers.

The community service activity for developing PSP-oriented chemistry instructional modules is conducted at UNNES via Zoom Meetings. The participants and target audience for the activity include chemistry teachers who are members of the MGMP Semarang and Kudus, chemistry education students from UNNES and participants of the PPG Chemistry program at SMA 4 and SMA 12 Semarang.

METHODS

The faculty team's community service activity aims to provide IHT training on developing PSP-oriented chemistry instructional modules. The community service activity takes place at UNNES through a Zoom Meeting. The participants and target audience for the activity include chemistry teachers from MGMP Semarang and Kudus, chemistry education students from UNNES, and participants of the TPE Chemistry program at SMA 4 and SMA 12 Semarang.

The community service activity is implemented through the following steps: (1) Presentation of Materials, Discussions, and Focus Group Discussions (FGD) related to the training program for developing chemistry teaching competencies in creating PSP-oriented instructional modules, (2) Conducting Training or IHT on enhancing competency in developing PSP instructional modules for chemistry teachers, including g knowledge about ChatGPT, ethical use of the ChatGPT application, and understanding instructional modules and PSP components according to the Merdeka Curriculum, (3) Development of PSP-Oriented Chemistry Instructional Modules for chemistry teachers, (4) Implementation of Training Sessions for creating PSP-oriented chemistry instructional modules, (5) Evaluation, Feedback, and Follow-Up Actions for the IHT program, (6) Preparation of Reports and Articles related to the activity.

RESULTS AND DISCUSSION

Implementation of Activities

To achieve the first objective of the community service activity, the initial phase involves providing training materials to the participants as the target audience for the IHT, emphasizing the importance of the activity. The urgency of the activity is addressed by presenting the following information and knowledge to the participants: (a) The implementation of the Merdeka Curriculum at the Elementary, Secondary, and Upper Secondary levels, where learning outcomes include content, science process skills, and the Strengthening of the Pancasila Student Profile (PSP); and (b) Findings from observations in schools, which indicate that some chemistry instructional modules developed

by chemistry teachers are not well-described in terms of PSP-oriented chemistry modules (Ariyatun, 2021; Sudarmin et al., 2023).

Involved in training for the development of a chemistry teaching module oriented toward PSP, utilizing the ChatGPT application. The community service activity occurred through an In-House Training (IHT) conducted via Zoom on May 17-18, 2024. The decision to hold the IHT online was based on coordination with the heads of MGMP Chemistry in Semarang and Kudus. The Vice Dean for Academic and Student Affairs of FMIPA UNNES officially opened the event. The activity was conducted with MGMP Chemistry Kudus, MGMP Chemistry Semarang, and Mahardika Indonesia. Participants included chemistry teachers from MGMP Chemistry Semarang and Kudus, UNNES chemistry education lecturers, and UNNES undergraduate and master's students in chemistry education. The target number of participants was 30, which was met and exceeded, including additional participants from chemistry and science education students.

To achieve the second goal of providing skills in creating chemistry teaching modules to strengthen the Pancasila Student Profile, several expert speakers presented on specific topics related to the training content. The speakers and their topics for the community service activity were: (1) Prof. Dr. Sudarmin, M.Si - Discussed Teaching Modules and their characteristics, as well as the scope and context of these modules within the Independent Curriculum, (2) Drs. Kasmui, M.Si - Focused on ethics in using ChatGPT and the application of ChatGPT technology for ethical education and learning, and (3) Wiwik Indah K, S.Pd, M.Pd (Chair of MGMP Semarang) - Presented on the



Figure 1. Implementation of ChatGPT Content Delivery and Development of ChatGPT-Oriented Teaching Modules

Table 1. The results of the analysis of responses to this community service activity are presented

| No | Questions to Students | Response (%) | | | |
|----|---|--------------|----|----|---|
| | | 4 | 3 | 2 | 1 |
| 1 | Understand the training topic from the participant | 34 | 63 | 3 | |
| 2 | Get useful information for your competition | 35 | 65 | 0 | 0 |
| 3 | Understand what GPT Chat is, its benefits, applications and ethics. | 35 | 55 | 10 | 0 |
| 4 | Understanding the objectives of training activities in IHT | 25 | 75 | 0 | 0 |
| 5 | The topic of the socialization of the training on the Preparation of Teaching Modules oriented towards Pancasila Student Profiles was good. | 45 | 50 | 5 | 0 |
| 6 | Media exposure of training activities is adequate and interesting. | 32 | 58 | 10 | 0 |
| 7 | The community service team resource person has provided information clearly and systematically. | 45 | 55 | 0 | 0 |
| 8 | Participants are able to apply Chat GPT to compile teaching modules oriented towards strengthening the Pancasila student profile. | 15 | 71 | 14 | 0 |
| 9 | Participants benefit from IHT activities and are able to improve teacher competency. | 25 | 75 | 0 | 0 |
| 10 | Participants think there needs to be follow-up to IHT activities | 30 | 70 | 0 | 0 |

elements and components of the Pancasila Student Profile and its implementation in chemistry content within the Independent Curriculum. In the activity, the components of the Pancasila Student Profile that will be developed and strengthened in students include (a) Faithful and Devout to God Almighty and Noble in Character, (b) Global Diversity, (c) Mutual Cooperation, (d) Independence, (e) Critical Thinking, and (f) Creativity ((Kemendikbubristek, 2021).

On the second day of the community service activity, a special session was conducted with Agung Ade Yulianto, S.Pd, regarding using ChatGPT to develop chemistry teaching modules oriented towards the Pancasila Student Profile (PSP). Participants received structured training on developing PSP-oriented chemistry teaching materials during the session, including practical examples. As the direct audience, participants engaged in hands-on practice and developed PSP-oriented chemistry teaching modules. Additionally, teams were formed to create these modules, consisting of four teams of chemistry teachers from the Chemistry Teacher Forum (MGM) Semarang and Kudus.

The IHT training activity concluded with an assignment for participants to develop PSP-oriented chemistry teaching modules. The resulting

modules will be reviewed, and feedback will be provided to improve them. During the module development phase, participants were divided into four large groups consisting of teachers from MGMP Kudus and Semarang. Additionally, undergraduate and master's students in chemistry education at UNNES were assigned to create PSP-oriented chemistry teaching modules for students.

At the end of the IHT activity, participant feedback was collected. Most responses indicated that the activity was engaging, important, and capable of enhancing participants' competencies in developing PSP-oriented chemistry teaching materials. Figure 1 presents evidence of the community service activity.

Participant Responses to the Community Service Implementation

During the implementation phase of the IHT training on developing PSP-oriented teaching modules, the training process was conducted in several stages. The stages completed were: (a) coordination meetings between the community service team of lecturers, the head of MGMP Chemistry, the community service team, and

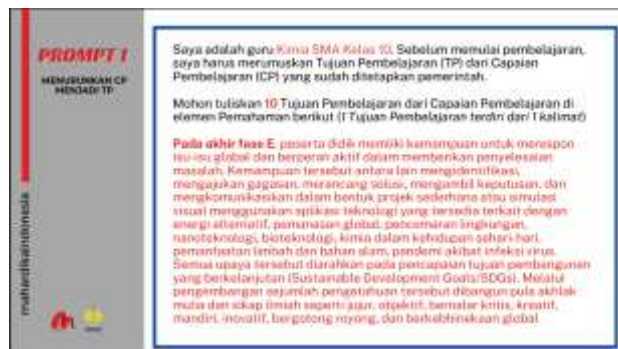


Figure 2. The examples of Prompt ChatGPT to Achieve Purpose Learning

UNNES Magister Chemistry Education students; (b) scheduling the training program; and (c) preparing the training materials. The training implementation phase included both theoretical knowledge and practical exercises. The training covered theoretical and practical aspects of creating Pancasila Student Profile-oriented chemistry teaching modules. The knowledge phase included webinars discussing ChatGPT concepts, ethical guidelines for using ChatGPT, the scope of chemistry content in the Independent Curriculum, PSP elements, and how to develop teaching modules using ChatGPT. The practical phase involved creating teaching modules and providing guidance through consultations to develop comprehensive, engaging, and curriculum-compliant Pancasila student profile-oriented chemistry teaching modules.

In the next phase, the community service team conducted an evaluation and monitoring of the activities. The evaluation and monitoring process

aimed to assess the entire community service activity from the beginning to the end of the IHT. Data on participant opinions regarding the training implementation from start to finish were collected using a questionnaire. The questions were designed by the community service team and referenced the instrument developed by Sudarmin et al. (2021). The results of the analysis of responses to the community service activity are presented in Table 1.

Based on the analysis of the data from the community service activity presented in Table 1, it is generally observed that the community service activity received positive feedback from the target audience, which consisted of chemistry teachers. The majority of participants agreed and strongly agreed on the significance of the community service initiative aimed at enhancing the competence of chemistry teachers in developing teaching modules oriented towards strengthening the Pancasila Student Profile with the assistance of



Figure 3. GPT chat response results for compiling learning objectives



Figure 4. Example of a GPT chat prompt for compiling a chemistry teaching module oriented towards the Pancasila Student Profile.

ChatGPT. Participants in the in-house training (IHT) expressed overwhelmingly positive responses, indicating that the IHT was engaging, important, and capable of increasing their knowledge and skills. In particular, they appreciated learning how to effectively and ethically utilize the Chat GPT application without violating scientific ethics. The responses from participants in the community service activity align well with the findings of research conducted by Ali, JKM et al. (2023), and Baidoo-Anu, D. (2023). These studies indicate that the use of ChatGPT can significantly enhance student motivation, interest, learning outcomes, and attitudes toward the science learning process.

Results of the Chemistry Teaching Module Project Oriented to Strengthening the Pancasila Student Profile

During the training phase, participants in the community service activity were also assigned the task of developing teaching modules (learning materials) oriented toward strengthening the Pancasila Student Profile. These modules included teaching media and assessment instruments. The topics and content of the teaching modules adhered to the latest Merdeka Curriculum for high schools, covering subjects such as Atomic Structure, Hydrocarbons, Benzene, Redox Reactions, and Electrolysis Cells. Additionally, participants developed practical chemistry topics like Green Chemistry in Environmental Management, the Scientific Method, and Laboratory Safety. The analysis of the developed teaching modules revealed that the learning models used included (a)

the Project-based learning model, (b) the Ethnoscience approach, (c) the STEM approach, and (d) Ethno-STEM approach. Moreover, the modules incorporated the components of Technological Pedagogical Content Knowledge (TPACK). The TPACK framework, developed by Mishra and Matthew J. Koehler in 2006, serves as a guideline for integrating technology into education. It combines three essential types of teacher knowledge: (a) Technological Knowledge (TK), Pedagogical Knowledge (PK), and Content Knowledge (CK). These components are crucial for teachers to effectively integrate technology into their teaching practices.

In the activity, participants were guided directly by a national resource person, Agung Ade Yulianto, from the Mahardika office. The preparation and development of the Pancasila student profile-oriented chemistry teaching module used the assistance of Chat GPT as directed by the speaker. In the activity, before the training, participants were introduced to and understood by the previous speakers, Sudarmin et al (2023) and Kasmui (2024). The activity is an activity for the second community service activity, namely, delivering the training topic well. Initially, the audience participants were taught how to install the Chat GPT application, and if there were problems, they were expected to ask the speaker or resource person about the community service activity. The results of the questionnaire showed that the participants of the activity, teachers and students, already knew and used the Chat GPT application, but only to ask questions, then the GPT chat program would answer the questions. During the

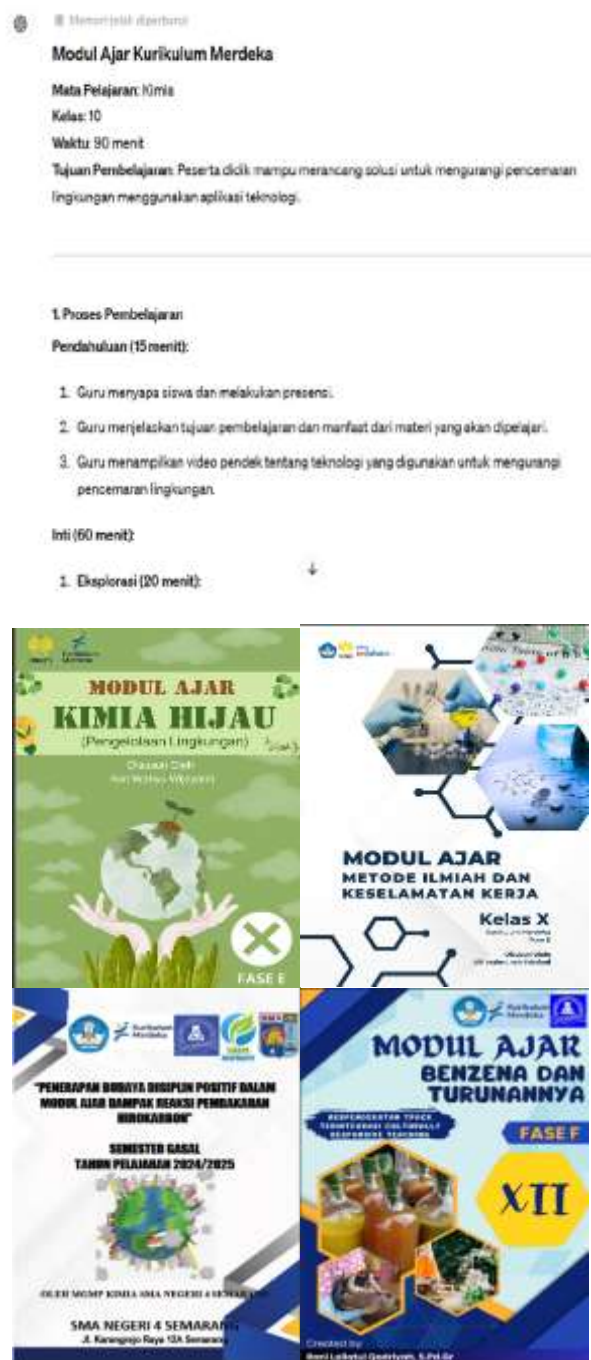


Figure 5. Covers of several teaching modules compiled by IHT participants

training activity, participants practiced how to utilize GPT Chat by compiling GPT Chat prompts in detail. For example, compiling learning objectives according to Learning Outcomes (CP) by writing down CP details can be seen in Figure 1. The results of the GPT chat response can be seen in Figure 2.

The results of the learning objectives in prompt 1 (Figure 1) can be developed for the next step, starting from learning strategy ideas, project ideas,

and even assessments. This will form a complete teaching module, but of course, the prompt used must be detailed and specific. Figure 4 presents an example of a Prompt for compiling a teaching module.

The teaching modules developed do not only focus on chemistry material but must also implement Pancasila student profile elements. The Pancasila student profile elements developed must be implicitly stated to be visible in the learning

PERTANYAAN PEMANTIK

1) Menurut kalian apakah kondisi lingkungan di sekitar kita baik-baik saja? Coba sebutkan salah satu masalah di lingkungan sekitar rumah kalian yang termasuk kerusakan lingkungan?

2) Adakah cara untuk mengatasi permasalahan tersebut?

D. KEGIATAN PEMBELAJARAN

| ATP-IPK | Nomor ATP yang ingin dicapai | |
|-------------|---|---------------|
| | 2.1 3.3 3.5 | |
| Komponen | Kegiatan Pembelajaran | Alokasi Waktu |
| Pendahuluan | <p>Orientasi</p> <ol style="list-style-type: none"> Guru mengucapkan salam untuk membuka pembelajaran. KSE: Pengelolaan diri PI: RBKCI Guru bersama peserta didik berdiskusi terlebih dahulu sebelum melaksanakan kegiatan belajar yang dipaparkan oleh salah satu perwakilan peserta didik. KSE: Kesadaran diri PI: RBKCI Guru meminta peserta didik untuk memeriksa kebersihan di sekitar tempat tinggalnya. KSE: Kesadaran diri Guru memeriksa kehadiran melalui mentimeter. TPACK: Technology and Knowledge Guru memberikan respon terhadap keadaan dan kondisi yang disampaikan oleh peserta didik. (4C-Communication and Collaboration) Guru melakukan tes diagnostik non-kognitif untuk mengetahui kondisi dan kesiapan peserta didik. Melalui link : https://forms.gle/dTbQztkcol3Pns3Q6 | 15 Menit |

Figure 6. Excerpt from the contents of the Pancasila Student Profile-oriented Chemistry teaching module, the results of IHT by participants

Table 2. Results of the Assessment of Teaching Modules by five Validators

| No | Book Title | Total Validator Score | | | | | Total Score | Skor (Mean) |
|----|---|-----------------------|----|----|----|----|-------------|-------------|
| | | 1 | 2 | 3 | 4 | 5 | | |
| 1. | <i>Kimia Hijau (Pengelolaan Lingkungan)</i> [Green Chemistry (Environmental Management)] | 52 | 50 | 48 | 35 | 52 | 237 | 16.9 |
| 2. | <i>Hidrokarbon PjBL dalam mengembangka Profil Pelajar Pancasila.</i> [Hydrocarbon PjBL in developing the Pancasila Student Profile.] | 54 | 53 | 46 | 55 | 53 | 261 | 18.6 |
| 3. | <i>Kimia Karbon Bermuatan Etnosains</i> [Carbon Chemistry with Ethnoscience Approach Learning] | 54 | 53 | 51 | 56 | 49 | 263 | 18.8 |
| 4. | <i>Kimia Struktur Atom untuk penguatan profil Pelajar Pancasila</i> (Atomic Structure Chemistry to strengthen the profile of Pancasila students) | 50 | 55 | 49 | 50 | 54 | 258 | 18.4 |
| 5. | <i>Kimia Hijau Terintegrasi Etnosains</i> [Integrated Green Chemistry Ethnoscience] | 54 | 51 | 49 | 56 | 42 | 252 | 18 |
| 6. | <i>Metode Ilmiah dan Keselamatan Kerja</i> [Scientific Method and Occupational Safety] | 50 | 46 | 53 | 41 | 51 | 241 | 17.2 |
| 7. | <i>Kimia Hijau Berorientasi Etno-SSI</i> [Ethno-SSI Oriented Green Chemistry Learning to Develop Pancasila Student Profile] | 52 | 53 | 51 | 53 | 53 | 262 | 18.7 |
| 8. | <i>Reaksi Redoks Terintegrasi Etno-STEM</i> [Integrated Redox Reactions Ethno-STEM approach] | 53 | 54 | 51 | 51 | 54 | 263 | 18.8 |

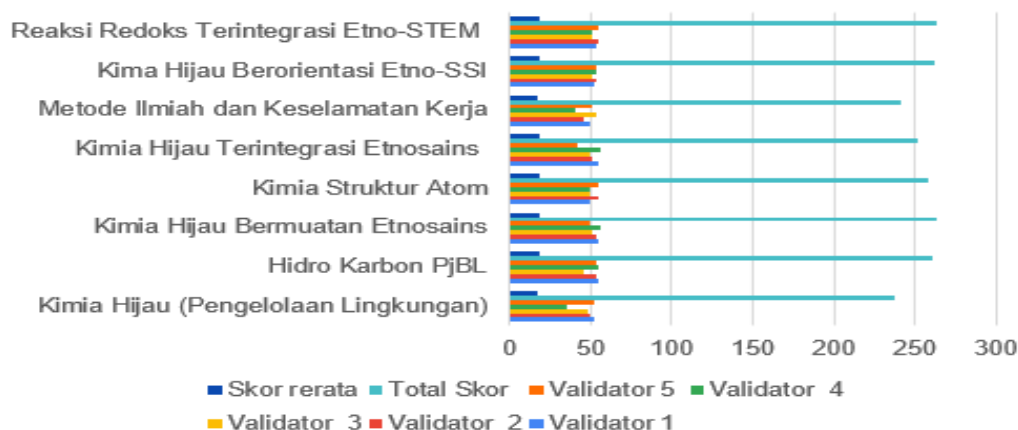


Figure 7. Results of the assessment of the Chemistry Teaching Module Product Oriented to Strengthening Pancasila student profile developed by the Training Participants.

process and equipped with assessment instruments. Figure 5 shows the results of compiling learning activities by including Pancasila student profile elements, TPACK, and 21st-century skills. In the activity, participants carry out activities guided by resource persons and the GPT chat application engine because the nature of the GPT chat is that ChatGPT can understand the context of the conversation and produce relevant and informative answers (Open, 2023, Vaswani, A, 2021).

In the activity, it was found that the enthusiasm of IHT participants was very high, as evidenced by the number of teaching modules collected exceeding the target of the activity. In addition, participants also expected similar activities with deeper themes, such as the preparation of the Pancasila Student Profile Strengthening Project (P5) content and innovative learning media. Results of the Assessment of Chemistry Teaching Module Products Oriented to Strengthening Pancasila Student Profiles In the community service activity, eight chemistry teaching modules oriented to Strengthening Pancasila Student Profiles were produced during the process of compiling the teaching module were always monitored and guided for each group through facilitation with the Zoom Meeting Link. The final results for each teaching module product are presented in Table 2.

Based on data from the results of the assessment of the chemistry teaching module oriented to Strengthening the Pancasila student profile Students by five validators, it is known that the teaching module is in the good and very good category of the eight teaching modules. In the community service activity, the assessment of the results of module development is based on the

module assessment guidelines for the Pancasila student profile in the context of the Merdeka curriculum (Susanti, 2021, Kemendikbud, 2023).

CONCLUSION

Based on the data from the implementation of the community service activity, the following conclusions can be drawn: (1) training participants have increased their competency in compiling chemistry teaching modules oriented towards strengthening the profile of Pancasila students, (2) chemistry teaching modules oriented towards strengthening the profile of Pancasila students have been produced with good and very good quality, (3) the response of the target audience from the community service activity is that it has had a positive impact.

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