

# DEVELOPING TEACHERS' COMPETENCE IN DESIGNING HOTS-BASED ASSESSMENTS THROUGH PROFESSIONAL TRAINING PROGRAMS: A QUANTITATIVE EVALUATION

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## Abstract

This community service study aimed to develop teachers' competence in designing Higher Order Thinking Skills (HOTS)-based assessments through a professional training program conducted at MA Al Ulum, Siak Regency, in March 2026. The participants consisted of 21 teachers from various subject areas. The service employed a one-group pretest-posttest quantitative evaluation design. The implementation flow included needs analysis, preparation of training modules, workshops on HOTS assessment principles, guided instrument development, peer review sessions, classroom-based simulations, and post-training evaluation. Data were collected through competency tests, observation sheets, and participant response questionnaires, then analyzed descriptively and inferentially. The results indicated a significant improvement in teachers' competence, with the mean score increasing from 58.4 in the pretest to 84.7 in the posttest, while participant satisfaction reached 91.3%. Statistical testing showed a significant difference at  $p < 0.05$ . The findings suggest that structured professional training can effectively strengthen teachers' pedagogical competence in constructing valid, analytical, and contextual HOTS-based assessments for classroom learning. The program also encouraged collaborative reflection and sustainable assessment practices aligned with curriculum and educational quality standards.

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## Introduction

The implementation of Higher Order Thinking Skills (HOTS)-based assessment has become an important concern in 21st-century education because it encourages students to develop analytical, evaluative, and creative thinking skills. Teachers are expected not only to master instructional materials but also to design assessments that stimulate critical and problem-solving abilities. However, many teachers still experience difficulties in constructing HOTS-oriented instruments due to limited pedagogical competence and inadequate professional development opportunities. Research shows that teachers' competence in developing HOTS-based assessments remains relatively low and requires systematic improvement through training and mentoring programs (Neina, 2020; Hamzah et al., 2022; Mazro'ah, 2023).

Educational assessment theoretically functions as a comprehensive tool to measure students' learning achievement. According to Bloom's revised taxonomy, HOTS assessment emphasizes higher cognitive domains, namely analyzing (C4), evaluating (C5), and creating (C6). This framework aligns with constructivist learning theory, which positions students as active learners who construct knowledge through reasoning and reflection. Consequently, teachers need sufficient competence in designing contextual and authentic assessment instruments that correspond with curriculum objectives and cognitive indicators (Listiani & Rachmawati, 2022; Guàrdia et al., 2023; Villarroel et al., 2024; Yan et al., 2024).

In practice, many teachers still focus on lower-order thinking questions because they encounter challenges in developing HOTS-oriented tasks. Several studies reported that teachers often struggle to formulate appropriate indicators, contextual stimuli, and analytical rubrics for higher-level assessments. Research conducted by Abkary and Purnawarman (2020) revealed that teachers faced conceptual and practical obstacles in assessing HOTS, particularly in aligning questions with higher cognitive domains. Similar findings also indicated that teachers predominantly construct questions at remembering and understanding levels rather than analytical and evaluative stages.

Professional training programs are widely recognized as an effective strategy for strengthening teachers' pedagogical competence in assessment development. Through workshops, mentoring, and collaborative discussions, teachers can improve their understanding of HOTS concepts and practice designing assessment instruments systematically. Neina (2020) emphasized that HOTS-based assessment training contributes significantly to improving pedagogical competence and teacher professionalism in curriculum implementation. Likewise, Riyadi et al. (2022) demonstrated that community service activities focusing on HOTS instrument preparation positively influenced teachers' competence in constructing assessment tools.

Recent studies also highlight the importance of sustainable professional development in improving teachers' assessment literacy. Continuous assistance, peer collaboration, and reflective evaluation are considered essential components in helping teachers apply HOTS assessment effectively in classroom practice. Sutoyo et al. (2023) found that training activities substantially improved teachers' competence in

developing HOTS-based instruments, especially in designing analytical and contextual questions. Furthermore, teacher empowerment programs through subject teacher associations have shown positive impacts on teachers' skills in preparing higher-order assessment tasks (Mazro'ah, 2023; Lee et al., 2024; Yuniarti et al., 2024; Zana et al., 2024).

Despite the growing number of studies discussing HOTS assessment and teacher competence, empirical evidence from educational community service programs in madrasah contexts remains limited. Most previous studies focused on formal research settings or specific subject teachers, while quantitative evaluations of community-based professional training involving cross-disciplinary teachers are still insufficient. In addition, studies examining competency improvement through pretest-posttest approaches in regional educational institutions are rarely reported. This gap indicates the need for measurable community service interventions that evaluate the effectiveness of professional training programs in improving teachers' competence in designing HOTS-based assessments.

Based on these issues, this community service program aimed to develop teachers' competence in designing HOTS-based assessments through professional training activities conducted at MA Al Ulum, Siak Regency, in March 2026. The program involved 21 teachers from various subject areas and employed a quantitative evaluation approach to measure competency improvement before and after the training. The service activities were expected to strengthen teachers' pedagogical competence, improve assessment quality, and encourage sustainable implementation of HOTS-oriented learning practices in madrasah education.

## Method

This community service activity employed a quantitative evaluation approach using a one-group pretest-posttest design to measure teachers' competence improvement in designing Higher Order Thinking Skills (HOTS)-based assessments. The activity was conducted in March 2026 at MA Al Ulum, Siak Regency, involving 21 teachers from various subject areas as participants. The quantitative approach was selected because it enables objective measurement of competency changes before and after the implementation of the professional training program (Astutik & Roesminingsih, 2021; Brundiars et al., 2021; Alm et al., 2022; Fundi et al., 2024).

The implementation of the service program consisted of several systematic stages. The first stage was a needs analysis conducted through preliminary observations and interviews with school administrators and teachers to identify difficulties in developing HOTS-based assessment instruments. Previous studies indicate that many teachers still experience challenges in constructing analytical, evaluative, and creative cognitive questions aligned with Bloom's revised taxonomy (Rachmawati & Purwati, 2021; West, 2023; Chuwa & Maro, 2025).

The second stage involved preparation and development of training materials, including concepts of HOTS assessment, cognitive level indicators (C4-C6), assessment blueprints, contextual stimulus construction, and scoring rubric preparation. The training modules were designed based on pedagogical competence

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frameworks and HOTS-oriented assessment principles to support teachers' professional development (Neina, 2020).

The third stage was the implementation of professional training activities through workshops, lectures, group discussions, guided practice, and peer-review sessions. Participants were trained to analyze curriculum indicators, formulate HOTS-oriented questions, develop authentic assessments, and evaluate assessment quality collaboratively. Practical mentoring was integrated into the workshop process because continuous assistance and collaborative learning are considered effective in improving teachers' assessment competence (Sutoyo et al., 2023).

The fourth stage consisted of simulation and evaluation activities. Teachers were asked to design HOTS-based assessment instruments independently and present their work for peer and facilitator feedback. The evaluation process included pretest and posttest assessments to measure participants' understanding and competence improvement after the training program. Similar approaches have been widely used in educational training programs to evaluate teacher competency enhancement quantitatively (Riyadi et al., 2022).

Data collection techniques included competency tests, observation sheets, documentation, and participant response questionnaires. The competency test measured teachers' ability to formulate HOTS-based questions, construct contextual stimuli, and align assessment indicators with higher-order cognitive levels. Observation sheets were used to assess participant engagement and practical performance during workshops, while questionnaires were distributed to evaluate participant satisfaction and perceptions regarding the effectiveness of the training program.

The collected data were analyzed quantitatively using descriptive and inferential statistical techniques. Descriptive analysis was used to calculate the mean, percentage, and improvement scores between pretest and posttest results, while inferential analysis using paired sample t-tests was employed to determine the significance of competency improvement after the implementation of the professional training program. This analytical approach is frequently used in evaluating teacher training effectiveness in HOTS-based educational programs (Astutik & Roesminingsih, 2021). Figure 1 presents the flow of the community service implementation.

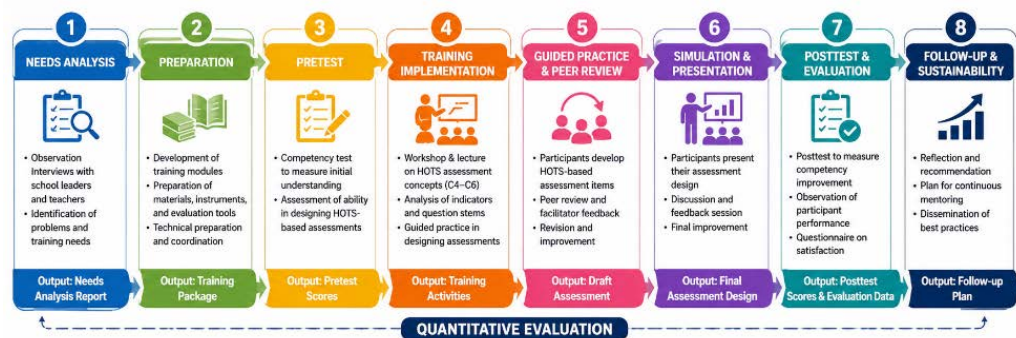


Figure 1. Flow of Community Service Implementation for Developing Teachers' Competence in Designing HOTS-Based Assessments through Professional Training Programs

## Results and Discussion

### A. *Description of Community Service Implementation*

The community service program entitled Developing Teachers' Competence in Designing HOTS-Based Assessments through Professional Training Programs: A Quantitative Evaluation was conducted in March 2026 at MA Al Ulum, Siak Regency. The activity involved 21 teachers from various subject areas and was designed to strengthen teachers' pedagogical competence in developing Higher Order Thinking Skills (HOTS)-based assessment instruments. The implementation of the service program was motivated by the limited ability of teachers to construct assessment items that measure higher cognitive domains such as analyzing, evaluating, and creating. Previous studies emphasized that teachers frequently encounter difficulties in preparing contextual and analytical questions aligned with HOTS principles (Neina, 2020).

The implementation began with a preliminary needs analysis stage through observation and interviews with school administrators and teachers. This stage aimed to identify teachers' understanding of HOTS assessment, challenges in constructing higher-order questions, and the forms of professional assistance needed during the training process. The findings indicated that most participants were still accustomed to developing lower-order cognitive questions focused on memorization and comprehension. Similar conditions have been reported in previous studies showing that teachers' assessment literacy remains limited, particularly in designing analytical and evaluative assessment instruments (Abkary & Purnawarman, 2020).

Following the needs analysis, the service team prepared training materials and learning instruments. The materials included concepts of HOTS assessment, Bloom's revised taxonomy, preparation of assessment blueprints, contextual stimulus development, rubric construction, and techniques for designing authentic assessment instruments. The training modules were developed systematically to ensure that participants could understand both theoretical and practical aspects of HOTS-based assessment development. This approach aligns with the concept of sustainable professional development that integrates conceptual understanding and practical application in teacher training programs (Sutoyo et al., 2023).

The core implementation stage consisted of professional training workshops conducted through lectures, discussions, guided practice, collaborative learning, and peer-review activities. During the workshop sessions, participants were introduced to HOTS assessment indicators at cognitive levels C4 (analyzing), C5 (evaluating), and C6 (creating). Facilitators provided examples of HOTS-oriented assessment items and guided teachers in developing questions based on curriculum learning outcomes. Teachers worked collaboratively in groups to formulate indicators, prepare contextual stimuli, and design scoring rubrics. Research indicates that collaborative mentoring and workshop-based learning effectively improve teachers' competence in assessment design and instructional planning (Rachmawati & Purwati, 2021).

After the workshop stage, participants conducted simulations and presentations of the HOTS-based assessments they had developed. Each teacher

presented assessment products and received feedback from facilitators and peer participants regarding question structure, cognitive level suitability, contextual relevance, and rubric quality. This reflective evaluation process enabled participants to revise and improve their assessment instruments systematically. Peer-review activities are considered effective in increasing teachers' reflective competence and promoting collaborative professional learning communities (Mazro'ah, 2023).

To evaluate the effectiveness of the service program, the implementation employed a quantitative evaluation approach using pretest and posttest instruments. The pretest was conducted before the training to measure participants' initial competence in designing HOTS-based assessments, while the posttest was administered after the completion of all workshop activities. In addition, observation sheets and participant response questionnaires were used to assess participation levels, practical performance, and satisfaction toward the training activities. Quantitative evaluation models are widely used in educational community service programs because they provide objective evidence regarding competency improvement after intervention activities (Riyadi et al., 2022).

The implementation results demonstrated that the professional training program positively contributed to improving teachers' competence in designing HOTS-based assessments. Participants showed better understanding in determining higher-order cognitive indicators, preparing contextual questions, and constructing analytical scoring rubrics. Moreover, the collaborative and practice-oriented training model increased teacher engagement and encouraged sustainable assessment development practices within the school environment. Therefore, this community service activity can serve as an effective model for strengthening teachers' pedagogical competence and improving assessment quality in madrasah education contexts.

## B. Presentation of Quantitative Results

The descriptive analysis was conducted to evaluate the effectiveness of the professional training program in improving teachers' competence in designing Higher Order Thinking Skills (HOTS)-based assessments at MA Al Ulum, Siak Regency. The analysis focused on participants' competency improvement before and after the implementation of the training program using pretest and posttest scores. In addition, participant participation and satisfaction were also analyzed to identify the effectiveness of the service activities quantitatively. Descriptive statistical analysis is widely used in educational training evaluation because it provides measurable information regarding competency development and program effectiveness (Riyadi et al., 2022).

**Table 1. Descriptive Statistical Results of Teachers' Competence Improvement**

| Variable      | Pretest | Posttest | Improvement |
|---------------|---------|----------|-------------|
| Mean Score    | 58.4    | 84.7     | 26.3        |
| Highest Score | 72      | 96       | 24          |
| Lowest Score  | 45      | 76       | 31          |

|                                      |        |        |        |
|--------------------------------------|--------|--------|--------|
| Standard Deviation                   | 8.12   | 5.46   |        |
| Percentage of Competency Achievement | 56.80% | 88.90% | 32.10% |
| Participant Satisfaction Level       | -      | 91.30% | -      |

The statistical results indicate that teachers' competence scores increased significantly following participation in the professional training program in designing HOTS-based assessments. The mean score increased from 58.4 in the pretest to 84.7 in the posttest, demonstrating substantial improvement in participants' understanding of HOTS concepts, cognitive indicators, contextual stimulus preparation, and rubric development. The standard deviation decreased from 8.12 to 5.46, indicating more homogeneous competency levels among participants after the training. Similar findings were reported by [Sutoyo et al. \(2023\)](#), who stated that structured HOTS training programs effectively improve teachers' assessment literacy and competency in constructing analytical and evaluative assessment instruments.

The improvement in competency achievement percentage from 56.8% to 88.9% demonstrates that most participants successfully understood the principles of HOTS-based assessment after the intervention. During the workshop sessions, participants actively engaged in collaborative discussions, guided practice, and peer-review activities, which contributed to the improvement of their pedagogical competence. Collaborative learning and reflective mentoring are considered important strategies in professional teacher development because they encourage knowledge sharing and practical problem-solving among participants ([Rachmawati & Purwati, 2021](#)).

Furthermore, the participant satisfaction level reached 91.3%, indicating that the training activities were positively perceived in terms of material relevance, mentoring effectiveness, and practical applicability in classroom assessment practices. Participants stated that the workshop activities helped them better understand how to formulate analytical, evaluative, and creative questions aligned with Bloom's revised taxonomy. This finding supports previous research emphasizing that professional training programs can strengthen teachers' pedagogical competence and improve assessment quality through systematic assistance and practice-oriented learning approaches ([Neina, 2020](#)).

The paired sample t-test result showing  $p < 0.05$  confirms that the competency improvement achieved after the implementation of the professional training program was statistically significant. This indicates that the educational service intervention effectively contributed to enhancing teachers' ability to design HOTS-based assessment instruments. Therefore, the implementation model used in this community service activity can serve as a practical reference for future teacher professional development programs in madrasah and other educational institutions. Similar quantitative evaluation approaches have also been recommended for measuring the effectiveness of educational community service activities in improving teacher competence sustainably ([Mazro'ah, 2023](#)).

### C. *Inferential Analysis Using Paired Sample T-Tests*

Inferential statistical analysis was conducted to determine whether the professional training program contributed positively to teachers' competence in designing Higher Order Thinking Skills (HOTS)-based assessments. The analysis employed a paired sample t-test because the study compared two related measurements, namely pretest and posttest scores obtained from the same participants before and after the implementation of the educational service program. The paired sample t-test is commonly used in educational intervention studies to evaluate the significance of competency improvement quantitatively (Riyadi et al., 2022).

**Table 2. Paired Sample t-Test Results**

| Variable        | Mean | SD   | T (20) | Sig. (2-tailed) | Interpretation       |
|-----------------|------|------|--------|-----------------|----------------------|
| Pretest Score   | 58.4 | 8.12 | 14.327 | < 0.001         | Significant          |
| Posttest Score  | 84.7 | 5.46 | -      | -               | -                    |
| Mean Difference | 26.3 | 6.74 | -      | -               | Increased Competence |

**Note:** N = 21; p < 0.05

The inferential analysis results demonstrate a statistically significant difference between pretest and posttest scores after the implementation of the professional training program. The mean score increased from 58.4 in the pretest to 84.7 in the posttest, with a mean difference of 26.3 points. The obtained t-value of 14.327 The magnitude of the improvement was substantial, indicating that the training program had a strong practical impact on participants' competence and significance value of < 0.001 ( $p < 0.05$ ) indicate that the training intervention had a significant positive effect on teachers' competence in designing HOTS-based assessments. These findings confirm that structured professional training effectively improves teachers' pedagogical skills in preparing higher-order cognitive assessment instruments. Similar findings were reported by Neina (2020), who found that HOTS-oriented training significantly enhanced teachers' pedagogical competence and professionalism in assessment implementation.

The significant improvement observed in the posttest results indicates that participants developed a better understanding of HOTS concepts, Bloom's revised taxonomy, contextual question construction, and analytical scoring rubrics. During the training process, teachers actively participated in workshops, guided practice, and peer-review activities that facilitated collaborative learning and reflective evaluation. Collaborative and practice-oriented training approaches are considered effective in strengthening teachers' assessment literacy and improving instructional competence (Rachmawati & Purwati, 2021).

Furthermore, the relatively lower standard deviation in the posttest scores suggests that participants achieved more homogeneous competency levels after the training program. This finding indicates that the service activities not only improved average competence but also reduced competency gaps among teachers. According to Sutoyo et al. (2023), continuous mentoring and guided practice significantly contribute

to improving teachers' consistency in developing HOTS-based assessment instruments across various learning contexts.

The inferential findings also support the effectiveness of educational community service programs as practical interventions for improving teacher competence in regional educational institutions. The implementation of systematic workshops, collaborative mentoring, and reflective feedback sessions enabled participants to apply HOTS assessment principles more effectively in classroom assessment practices. Similar studies have emphasized that quantitative evaluation through paired sample t-tests provides strong empirical evidence regarding the success of teacher professional development programs ([Mazro'ah, 2023](#)).

Overall, the inferential statistical analysis confirms that the professional training program strengthened teachers' competence in designing HOTS-based assessments at MA Al Ulum, Siak Regency. Therefore, this training model can be recommended as an effective strategy for strengthening pedagogical competence and improving assessment quality in madrasah and other educational institutions.

#### ***D. Discussion***

The results of this community service program demonstrate that professional training was associated with improvements in teachers' competence in designing Higher Order Thinking Skills (HOTS)-based assessments at MA Al Ulum, Siak Regency. The increase in posttest scores and the significant paired sample t-test results indicate that structured training activities effectively strengthened teachers' pedagogical competence in constructing analytical, evaluative, and creative assessment instruments. This finding is consistent with the theory of constructivist learning, which emphasizes that teachers should facilitate students' higher-level cognitive development through contextual and reflective assessment practices. In Bloom's revised taxonomy, HOTS-oriented assessment focuses on cognitive domains of analyzing (C4), evaluating (C5), and creating (C6), which require teachers to possess adequate assessment literacy and instructional competence ([Anderson & Krathwohl, 2001](#)). The findings also support the argument that teacher competence development can be achieved through systematic professional training and collaborative learning experiences.

The improvement in teachers' competence after the implementation of the training program confirms that workshop-based professional development contributes positively to teachers' understanding of HOTS principles and assessment design techniques. During the training activities, participants received theoretical explanations, practical exercises, mentoring, and peer-review opportunities that enabled them to develop assessment instruments aligned with higher-order cognitive skills. According to adult learning theory, professional learning becomes more effective when participants are actively involved in practical and collaborative activities that relate directly to their professional context. Similar findings were reported by [Astutik and Roesminingsih \(2021\)](#), who found that HOTS-based training significantly improved teachers' professional competence through participatory workshops and reflective learning approaches.

The findings also reveal that teachers initially experienced difficulties in preparing HOTS-oriented questions, particularly in designing contextual stimuli, analytical indicators, and authentic scoring rubrics. This condition supports previous studies indicating that many teachers still rely on lower-order cognitive assessments because of limited understanding of HOTS concepts and insufficient assessment training. Dahlan et al. explained that teachers frequently encounter conceptual and technical challenges when developing HOTS instruments, especially in aligning assessment indicators with higher cognitive processes. Similar results were also identified by [Rachmawati and Purwati \(2021\)](#), who stated that teachers' competence in HOTS-based formative assessment is strongly influenced by pedagogical readiness and assessment literacy.

The collaborative mentoring model implemented during the service activities also played an important role in improving participants' competence. Teachers were encouraged to discuss assessment problems, exchange ideas, and evaluate each other's assessment products through peer-review sessions. This collaborative learning process aligns with social constructivist theory, which emphasizes knowledge construction through interaction and reflective dialogue among participants. The peer-review and mentoring approach helped teachers better understand the characteristics of HOTS assessment and reduced their difficulties in designing contextual and analytical questions. Previous studies by [Mazro'ah \(2023\)](#) demonstrated that teacher empowerment through collaborative subject teacher consultations (MGMP) effectively improved teachers' competence in developing HOTS-oriented assessment instruments.

Another important finding of this service activity is the increased consistency of teachers' competence after the intervention, as indicated by the lower standard deviation in posttest scores. This suggests that the training program not only improved average competence but also reduced competency disparities among participants. Consistent competency improvement is essential because effective HOTS implementation requires all teachers to possess relatively similar pedagogical abilities in assessment development. [Sutoyo and Supardi \(2023\)](#), emphasized that continuous assistance and guided practice significantly contribute to strengthening teachers' consistency in designing HOTS-based assessment instruments across different learning contexts.

The high level of participant satisfaction also indicates that the training materials, mentoring process, and practical activities were relevant to teachers' professional needs. Participants considered the training useful because it provided practical guidance for integrating HOTS principles into classroom assessment practices. This finding supports previous community service studies showing that practical and needs-based training programs are more effective in improving teacher competence than theoretical seminars alone. [Riyadi et al. \(2022\)](#) found that HOTS-oriented assessment training positively influenced teachers' understanding of assessment instruments and encouraged the implementation of 21st-century learning competencies in schools.

Overall, the results of this community service activity confirm that professional training programs can effectively strengthen teachers' competence in designing

HOTS-based assessments. The integration of workshops, collaborative mentoring, guided practice, and reflective evaluation successfully improved teachers' pedagogical competence and assessment literacy. These findings reinforce previous studies emphasizing that sustainable professional development is essential for improving educational quality and supporting the implementation of 21st-century learning. Therefore, this service model can be recommended as an effective strategy for enhancing teachers' professional competence in madrasah and other educational institutions, particularly in regional contexts where HOTS-based assessment implementation remains limited.

Several limitations should be acknowledged. The program involved only 21 teachers from a single madrasah, which may limit the generalizability of the findings. In addition, the evaluation focused primarily on short-term competency improvement measured through pretest and posttest assessments. Future programs should involve larger participant groups and conduct follow-up evaluations to examine the long-term sustainability of competence development

## **Conclusion**

The community service program on developing teachers' competence in designing Higher Order Thinking Skills (HOTS)-based assessments through professional training programs successfully improved the pedagogical competence of teachers at MA Al Ulum, Siak Regency. The quantitative evaluation results demonstrated a significant increase in teachers' understanding and skills in constructing HOTS-oriented assessment instruments, particularly in formulating analytical, evaluative, and creative questions aligned with Bloom's revised taxonomy. The improvement in posttest scores and the significant paired sample t-test results indicate that the implementation of structured workshops, guided practice, collaborative mentoring, and peer-review activities effectively strengthened teachers' assessment literacy and professional competence.

Furthermore, the training program contributed positively to increasing teachers' confidence, consistency, and readiness to implement HOTS-based assessment practices in classroom learning. The collaborative and practice-oriented training approach encouraged active participation and reflective learning among participants, thereby supporting sustainable professional development within the school environment. Therefore, this educational service model can be recommended as an effective strategy for improving assessment quality and strengthening teacher professionalism in madrasah and other educational institutions, particularly in regional contexts that require continuous pedagogical capacity development.

## **Recommendation**

Based on the results of this community service activity, schools and educational institutions are recommended to implement sustainable professional development programs focusing on HOTS-based assessment design and assessment literacy improvement. Continuous training activities should not only emphasize theoretical

understanding but also integrate practical workshops, mentoring, peer-review sessions, and reflective evaluation to ensure that teachers are able to apply HOTS principles effectively in classroom assessment practices. In addition, institutional support through teacher working groups, collaborative learning communities, and periodic supervision is necessary to maintain the consistency and sustainability of HOTS-oriented assessment implementation in schools.

Furthermore, future community service programs and educational research are recommended to expand the scope of participants, involve larger samples from different educational levels, and apply more comprehensive evaluation approaches to examine the long-term effectiveness of professional training programs. Future studies may also integrate digital assessment platforms, technology-based learning tools, and interdisciplinary assessment models to strengthen teachers' competence in responding to the demands of 21st-century education. Therefore, collaboration among universities, schools, and educational stakeholders is essential for developing sustainable teacher empowerment programs that improve educational quality and students' higher-order thinking skills comprehensively.

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## References

- Abkary, N. S., & Purnawarman, P. (2020). Indonesian EFL teachers' challenges in assessing students' Higher-Order Thinking Skills (HOTS). *Advances in Social Science, Education and Humanities Research*. <https://doi.org/10.2991/assehr.k.201215.076>.
- Alm, K., Beery, T. H., Eiblmeier, D., & Fahmy, T. (2022). Students' learning sustainability-implicit, explicit or non-existent: A case study approach on students' key competencies addressing the SDGs in HEI program. *International Journal of Sustainability in Higher Education*, 23(8), 60-84. <https://doi.org/10.1108/IJSHE-12-2020-0484>.
- Anderson, L. W., & Krathwohl, D. R. (2001). A taxonomy for learning, teaching, and assessing: A revision of bloom's taxonomy of educational objectives. *Longman*.

- Astutik, K. F., & Roesminingsih, E. (2021). The improvement of teachers' professional competency through HOTS-Based training. *Jurnal Pendidikan Indonesia*, 10(1), 145-151. <https://doi.org/10.23887/jpi-undiksha.v10i1.22407>.
- Brundiers, K., Barth, M., Cebrián, G., Cohen, M., Diaz, L., Doucette-Remington, S., ... & Zint, M. (2021). Key competencies in sustainability in higher education—toward an agreed-upon reference framework. *Sustainability science*, 16(1), 13-29. <https://doi.org/10.1007/s11625-020-00838-2>.
- Cammies, C., Cunningham, J. A., & Pike, R. K. (2024). Not all Bloom and gloom: Assessing constructive alignment, higher order cognitive skills, and their influence on students' perceived learning within the practical components of an undergraduate biology course. *Journal of Biological Education*, 58(3), 588-608. <https://doi.org/10.1080/00219266.2022.2092191>.
- Chuwa, E. I., & Maro, W. E. (2025). Experiences and challenges of using the revised Bloom's taxonomy in teaching and learning Geography: A study of ordinary-level secondary school teachers in Tanzania. *Cogent Education*, 12(1), 2553834. <https://doi.org/10.1080/2331186X.2025.2553834>.
- Dahlan, D., Permana, L., & Oktariani, M. (2020). Teacher competence and difficulties in constructing HOTS instruments in economics subject. *Cakrawala Pendidikan*, 39(1), 111-122. <https://doi.org/10.21831/cp.v39i1.28869>.
- Devian, L., & Desyandri. (2022). Pelatihan penyusunan instrumen penilaian berbasis HOTS bagi guru. *Didaktik : Jurnal Ilmiah PGSD STKIP Subang*, 8(2), 1964-1972. <https://doi.org/10.36989/didaktik.v8i2.500>.
- Fundi, M., Sanusi, I. T., Oyelere, S. S., & Ayere, M. (2024). Advancing AI education: Assessing Kenyan in-service teachers' preparedness for integrating artificial intelligence in competence-based curriculum. *Computers in Human Behavior Reports*, 14, 100412. <https://doi.org/10.1016/j.chbr.2024.100412>.
- Guàrdia, L., Maina, M., Mancini, F., & Martinez Melo, M. (2023). Key quality factors in digital competence assessment: A validation study from teachers' perspective. *Applied Sciences*, 13(4), 2450. <https://doi.org/10.3390/app13042450>.
- Hamzah, H., Hamzah, M. I., & Zulkifli, H. (2022). Systematic literature review on the elements of metacognition-based higher order thinking skills (HOTS) teaching and learning modules. *Sustainability*, 14(2), 813. <https://doi.org/10.3390/su14020813>.
- Lee, H. Y., Chen, P. H., Wang, W. S., Huang, Y. M., & Wu, T. T. (2024). Empowering ChatGPT with guidance mechanism in blended learning: Effect of self-regulated learning, higher-order thinking skills, and knowledge construction. *International Journal of Educational Technology in Higher Education*, 21(1), 16. <https://doi.org/10.1186/s41239-024-00447-4>.
- Listiani, W., & Rachmawati, R. (2022). Transformasi taksonomi bloom dalam evaluasi pembelajaran berbasis HOTS. *Jurnal Jendela Pendidikan*, 2(03), 397-402. <https://doi.org/10.57008/jjp.v2i03.266>.
- Malahayati, E. N. (2020). Meningkatkan keterampilan mengajar guru melalui pendampingan penyusunan perangkat pembelajaran dan penilaian HOTS: Improve teacher teaching skills through assistance in the preparation of learning

- tools and HOTS assessment. *BIODIK*, 6(4), 423-433. <https://doi.org/10.22437/bio.v6i4.9914>.
- Mazro'ah, U. (2023). Increasing teacher competence in compiling level Higher Order of Thinking Skill (HOTS) questions through the empowerment of subject teacher consultations: Peningkatan kompetensi guru dalam penyusunan soal level Higher Order of Thinking Skill (HOTS) melalui pemberdayaan Musyawarah Guru Mata Pelajaran (MGMP). *Edulab: Majalah Ilmiah Laboratorium Pendidikan*, 8(1), 107-126. <https://doi.org/10.14421/edulab.2023.81.08>.
- Neina, Q. A. (2020). Implementation of Higher Order Thinking Skills (HOTS) in 2013 curriculum assessment to improve pedagogic competence and teacher professionalism. In *BASA 2019: Proceedings of the Third International Seminar on Recent Language, Literature, and Local Culture Studies*, BASA, 20-21 September 2019, Surakarta, Central Java, Indonesia (p. 467). European Alliance for Innovation. <https://doi.org/10.4108/eai.20-9-2019.2296854>.
- Rachmawati, D. L., & Purwati, O. (2021). EFL teachers' attitudes and competence in developing HOTS-based formative assessment. *JEES (Journal of English Educators Society)*, 6(2). <https://doi.org/10.21070/jees.v6i2.1060>.
- Riyadi, R., Madani, F., Apriliani, L., & Siva, A. N. (2022). Peningkatan kompetensi guru melalui penyusunan instrumen penilaian berbasis HOTS. *Sarwahita*, 19(edisi khusus), 568-582. <https://doi.org/10.21009/sarwahita.19k.6>.
- Suhendro, S., Sugandi, D., & Ruhimat, M. (2021). Analysis on factors influencing geography teachers' ability in constructing High-Order Thinking Skills (HOTS) assessment instrument. *Geosfera Indonesia*, 6(2), 205-221.
- Sutoyo, S., & Supardi, Z. A. I. (2023). Improving the competence of chemistry teachers in developing the assessment instrument based on higher order thinking skills (HOTS). In *1st Lawang Sewu International Symposium on Humanities and Social Sciences 2022 (LEWIS 2022)* (pp. 47-56). Atlantis Press. [https://doi.org/10.2991/978-2-38476-078-7\\_7](https://doi.org/10.2991/978-2-38476-078-7_7).
- Villarroel, V., Bruna, D., Bruna, C., Brown, G., & Boud, D. (2024). Authentic assessment training for university teachers. *Assessment in Education: Principles, Policy & Practice*, 31(2), 116-134. <https://doi.org/10.1080/0969594X.2024.2350395>.
- West, J. (2023). Utilizing Bloom's taxonomy and authentic learning principles to promote preservice teachers' pedagogical content knowledge. *Social Sciences & Humanities Open*, 8(1), 100620. <https://doi.org/10.1016/j.ssaho.2023.100620>.
- Yan, L., Greiff, S., Teuber, Z., & Gašević, D. (2024). Promises and challenges of generative artificial intelligence for human learning. *Nature human behaviour*, 8(10), 1839-1850. <https://doi.org/10.1038/s41562-024-02004-5>.
- Yuniarti, N., Rachmawati, Y., Anwar, M., Al Hakim, V. G., Hidayat, H., Hariyanto, D., ... & Wang, J. H. (2024). Augmented reality-based higher order thinking skills learning media: Enhancing learning performance through self-regulated learning, digital literacy, and critical thinking skills in vocational teacher education. *European Journal of Education*, 59(4), e12725. <https://doi.org/10.1111/ejed.12725>.

Zana, F. M., Sa'dijah, C., Susiswo, L. A., & Zulnaldi, H. (2024). Curriculum and teacher assessment practices in mathematics learning: Alignment with higher order thinking skills in Indonesian secondary schools. *Journal on Mathematics Education*, 15(4), 1311-1334. <https://doi.org/10.22342/jme.v15i4.pp1311-1334>.