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ARTICLE

Analysis of the Development of Chemistry Analysis Try-Out Questions and Their Impact on the Graduation of Professional Teacher Education (PPG) Students

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Abstract

This study describes the development of try-out questions for Professional Teacher Education (PPG) students in Chemical Analysis at Universitas Negeri Malang. The try-out questions, consisting of 35 Pedagogical Content Knowledge (PCK) questions, were designed to assess students' understanding of chemistry analysis and their ability to apply it in real-world scenarios. The development process involved integrating Question Analysis Materials, Subject Matter Study Materials, and Cognitive Level of Questions to create relevant and challenging questions. Expert feedback was incorporated to revise and improve the questions, resulting in a low error rate of 5% for the Chemical Analysis set questions. After revision based on expert feedback, the try-out was administered to two students from Universitas Negeri Malang (UM) who were nationally selected for the PPG program. The results of the try-out were discussed with the lecturer to prepare for the final test of PPG. The try-out questions demonstrated promising results, with a 100% pass rate for the PPG students in Chemical Analysis, indicating their effectiveness in assessing students' understanding and application of chemistry analysis concepts.

Keywords:

Chemistry analysis; Professional Teacher; Education; Teacher preparedness; Try-out questions; Vocational high school.

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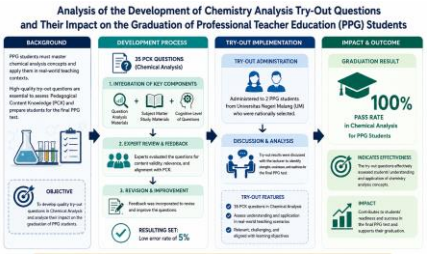
Graphical Abstract



Introduction

The development of high-quality assessment tools is crucial in education, particularly in Professional Teacher Education (PPG) programs. As future educators, PPG students must possess a deep understanding of their subject matter, including chemistry analysis. However,

many students struggle with abstract concepts in chemistry, such as electrochemistry and analytical techniques (Puji Cahyani & Sutrisno, 2018). To address this challenge, educators must design effective assessment tools, including try-out questions, to evaluate students' understanding and prepare them for actual exams.

Try-out questions play a vital role in assessing students' knowledge and skills in chemistry analysis. Well-designed try-out questions can help identify areas where students need improvement, allowing educators to adjust their teaching strategies accordingly (Cooper, 2015). Moreover, try-out questions can also help students develop critical thinking and problem-solving skills, which are essential for success in chemistry analysis.

In the context of PPG programs, the development of try-out questions is particularly important. PPG students are expected to become competent educators who can effectively teach and assess their own students (Korsakova et al., 2022). Therefore, it is essential to ensure that PPG students are well-prepared to design and administer assessments that accurately measure student learning outcomes.

Despite the importance of try-out questions, there is limited research on their development and impact on student learning outcomes in PPG programs. This study aims to address this gap by analyzing the development of chemistry analysis try-out questions and their impact on the graduation of PPG students.

By examining the effectiveness of try-out questions in chemistry analysis, this study can provide insights into how educators can design assessments that support student learning and improve graduation outcomes. The findings of this study can also inform the development of assessment tools in other STEM fields, ultimately contributing to the improvement of teacher education programs (Chambers et al., 2019; Moore, 2007; Sona et al., 2023). We developed and validated try-out questions for chemistry analysis, comparing them with chemical engineering and pure chemistry set questions, and investigated their impact on PPG student graduation outcomes.

Method

The development of try-out questions for Professional Teacher Education (PTE) at Universitas Negeri Malang in 2025 focuses on creating Higher Order Thinking Skills (HOTS)-based questions with contextual case studies. The try-out questions consist of 35 Pedagogical Content Knowledge (PCK) questions. The question types include simple and complex multiple-choice questions, with difficulty levels following a normal curve distribution. The competencies used as the basis for question development are based on the Director-General's Regulation No. 2626/B/HK/04.01/2023, which includes pedagogical, personality, social, and professional competencies. Data analysis and interpretation techniques include item analysis, which evaluates the difficulty index and discriminating power of each question to determine its effectiveness. The try-out questions were validated by experts before being

administered to two students who were nationally selected for the PPG program at UM. The validation process ensured that the questions were effective in assessing the students' knowledge and skills.

The detailed production process of the try-out questions is outlined below:
- PCK Questions: 35 questions
- Question Types:
- Simple Multiple Choice: 25 questions
- Complex Multiple Choice: 10 questions
- Difficulty Levels:
- Simple Multiple Choice: 6 easy, 13 medium, 6 difficult
- Complex Multiple Choice: 2 easy, 6 medium, 2 difficult
- Competencies: Pedagogical, Personality, Social, Professional (based on Director-General's Regulation No. 2626/B/HK/04.01/2023)

The guidelines for preparing questions are structured as follows:

a. Competency Mapping: Please map the competencies according to the respective subject areas using the following link: (link unavailable)

b. Question Format: Each question should include:
- a) The question itself
- b) The answer key
- c) The scoring guidelines

For validation and comparison purposes, the chemistry analysis try-out questions were validated by chemistry experts and PPG managerial staff, and then compared with two sets of try-out questions from chemical engineering and pure chemistry.

Results & Discussion

Development of Chemical Analysis Try-out for PPG Students

The development of chemistry analysis try-out questions for Professional Teacher Education (PPG) students at Universitas Negeri Malang has shown promising results. The try-out questions, which consisted of 35 Pedagogical Content Knowledge (PCK) questions was designed to assess students' understanding of chemistry analysis and their ability to apply it in real-world scenarios. As listed in Table 1, the reconstruction of advanced question design was applied to facility the PPG student for facing on the real examination. All design is made based on the subject matter in the SMK's curriculum.

As listed in Table 1, the twelve components as question materials serve as the foundation for deriving study materials for SMK teaching. The development of effective try-out questions for SMK Chemistry analysis requires a deep understanding of the relationship between Question Analysis Materials, Subject Matter Study Materials, and Cognitive Level of Questions.

Question Analysis Materials provide a framework for identifying the key concepts and skills that students need to master, while Subject Matter Study Materials offer a rich source of content knowledge that can be used to craft relevant and challenging questions. By analyzing the Subject Matter Study Materials, educators can identify the most critical topics and concepts that students need to understand, and then use this information to develop questions that assess students' knowledge and skills at various cognitive levels. The Cognitive Level of Questions, such as knowledge recall, comprehension, application, analysis, synthesis, and evaluation, provide a taxonomy for categorizing questions based on the level of cognitive demand required to answer them (Toledo & Dubas, 2016; Ulfa et al., 2021).

By integrating Question Analysis Materials, Subject Matter Study Materials, and Cognitive Level of Questions, educators can create try-out questions that are not only relevant and challenging but also aligned with the learning objectives and outcomes of the SMK Chemistry analysis curriculum. This integrated approach enables educators to assess students' knowledge and skills in a comprehensive and nuanced way, providing valuable insights into their strengths and weaknesses and informing instruction, assessment practices, and learning innovations (Widarti et al., 2022).

The subject matter study materials are evenly chosen from acid-base titration to UV-Vis spectrometry applications in chemistry, aligning with the outcomes for SMK graduates. SMK students need to master the basics of instrumentation skills. Graduates of SMK programs in chemical analysis are in high demand as employees in various industries, particularly the medical industry, food industry, and colorless industry, among others. The subject matter study materials for SMK chemistry students are carefully selected to cover a range of topics, from fundamental analytical techniques like acid-base titration to advanced instrumental methods like UV-Vis spectrometry. This comprehensive approach ensures that students gain a broad understanding of chemical analysis principles and practices, preparing them for various career paths in the industry. By mastering these topics, students develop a solid foundation in analytical chemistry, enabling them to tackle complex problems and make informed decisions in their future roles and developing of critical thinking (Qi et al., 2024).

To achieve the desired learning outcomes, SMK students need to develop proficiency in instrumentation skills, including understanding the principles, operation, and maintenance of various analytical instruments. This includes familiarity with chromatography, spectroscopy, and other techniques commonly used in chemical analysis.

By mastering these skills, students can accurately and precisely analyze samples, interpret results, and troubleshoot instrumentation issues, making them valuable assets to potential employers. The demand for skilled chemical analysts is driven by the need for quality control and assurance in various industries, including pharmaceuticals, food and beverages, and environmental monitoring. Graduates of SMK programs in chemical analysis can expect to find employment opportunities in laboratories, research institutions, and manufacturing facilities, where they will apply their knowledge and skills to ensure product quality, safety, and compliance with regulatory standards. With the increasing emphasis on quality and

safety, the job prospects for SMK graduates in chemical analysis are promising, and their skills will remain in high demand in the industry.

As listed in Table 1, to assess the competence of SMK students in chemical analysis, try-out questions need to be designed to evaluate their cognitive skills at various levels. Starting from the Application level (C3), questions can be crafted to test students' ability to apply theoretical knowledge to practical problems, such as calculating the concentration of a solution or interpreting chromatographic data. This level of questioning requires students to demonstrate their understanding of chemical analysis principles and their ability to apply them in real-world scenarios. At the Analysis level (C4), questions can be designed to assess students' ability to break down complex information, identify patterns, and make connections between different concepts. For example, students might be asked to compare and contrast different analytical techniques, such as HPLC and GC, or to identify the sources of error in a particular experiment and their application and analyzes (Byrne, 2025; Harvey et al., 1991; Qi et al., 2024; Wang et al., 2024). This level of questioning requires students to think critically and demonstrate their ability to analyze complex data and information. At the Synthesis level (C5), questions can be crafted to evaluate students' ability to create new knowledge or solutions by combining existing information and concepts. For instance, students might be asked to design an experiment to analyze a particular sample, or to develop a new method for detecting a specific analyte. This level of questioning requires students to think creatively and demonstrate their ability to apply chemical analysis principles to novel situations, making them more prepared for real-world challenges in the industry (García-Vargas et al., 2024).

As shown in Figure 1(a), the development of try-out questions for PPG students majoring in Chemical Analysis at SMK aims to assess their readiness for the actual PPG exam. The questions are designed in a multiple-choice format, categorized into easy (6%), medium (13%), and difficult (6%) levels, to evaluate students' understanding of various concepts in chemical analysis. This distribution of question difficulty is intended to simulate the actual exam experience, allowing students to gauge their strengths and weaknesses. In addition to multiple-choice questions, complex multiple-choice questions are also included, with a distribution of easy (2%), medium (6%), and difficult (2%) levels (Figure 1b). These questions require students to apply critical thinking and problem-solving skills, making them more challenging than standard multiple-choice questions. By incorporating complex multiple-choice questions, the try-out aims to assess students' ability to analyze complex information and make informed decisions. The primary objective of this try-out is to provide PPG students with an opportunity to familiarize themselves with the exam format and content, identify areas for improvement, and develop effective strategies to pass the actual PPG exam. By analyzing the results of the try-out, students can refine their study plans, focus on weak areas, and build confidence in their abilities. Ultimately, the try-out is designed to support students in achieving success in the PPG exam and becoming qualified chemical analysis teachers.

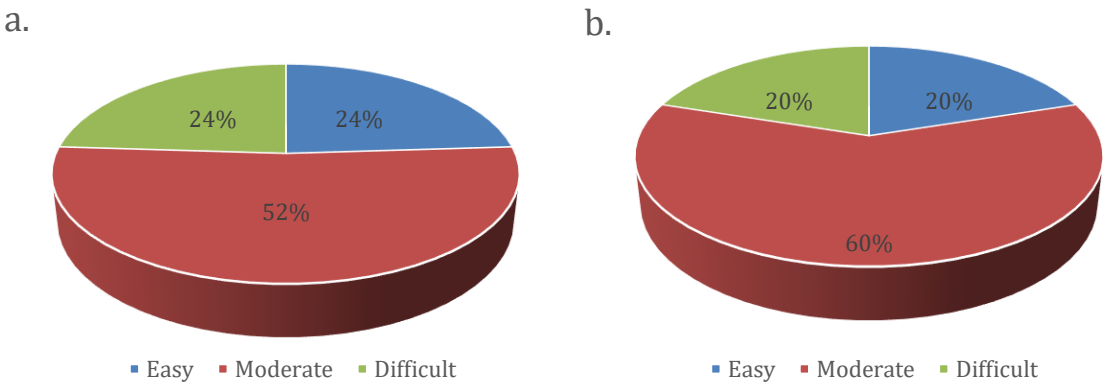


Figure 1. Distribution of item difficulty levels for multiple choice (a) and complex multiple choice (b).

As listed in Table 2, the try-out questions were reviewed by an expert to ensure their validity and effectiveness in assessing students' knowledge and skills. The results are available in the link below, presented in Bahasa form: https://docs.google.com/spreadsheets/d/1Q8LEo-zdQez2VgzyKQbx6tA3A-eHumsanFMpl2EDC0c/edit?usp=sharing.. Based on the expert's feedback, several questions were revised to better align with the learning objectives. Specifically, questions 7, 12, 17, 24, and 30 were identified as areas for improvement. The expert suggested that these questions be revised to provide clearer instructions and more relevant answer choices. One of the key suggestions made by the expert was to specify the type of special needs student in question 12. By providing more context about the student's needs, such as visual or hearing impairment, the answer choices could be tailored to better reflect the required accommodations. This would enable students to demonstrate their understanding of inclusive teaching practices and adapt their strategies accordingly.

In question 17, the expert recommended revising the narrative to better reflect real-world scenarios. For example, the scenario could involve reporting laboratory test results to the head of a food regulatory agency. This would make the question more relevant and engaging for students, while also assessing their ability to apply theoretical knowledge in practical contexts. The expert also suggested that the correct answers for question 24 should be options 1, 2, 3, and 5. To achieve this, the narrative for option 5 could be revised to focus on reporting laboratory test results to the relevant authorities. By making this change, the question would more accurately assess students' understanding of laboratory safety protocols and procedures. By incorporating the expert's feedback, the try-out questions can be refined to better assess students' knowledge and skills in chemical analysis. The revised questions will provide a more accurate measure of students' readiness for the actual PPG exam, while also helping them develop the skills and confidence needed to succeed in their future careers as chemical analysis teachers.

The expert's recommendations were instrumental in strengthening the try-out questions, particularly in the area of Effective Student-Centered Learning. By incorporating more

nuanced and context-specific scenarios, the questions were able to better assess students' ability to design and implement student-centered learning with social media approaches (Hight et al., 2021). This, in turn, will help students develop the skills and knowledge needed to create engaging and inclusive learning environments that cater to the diverse needs of their students. The expert's feedback also highlighted the importance of assessing students' behavior reflecting moral, emotional, and spiritual maturity in accordance with the Teacher's Code of Ethics. By incorporating questions that evaluate students' ability to make ethical decisions and demonstrate professional integrity, the try-out questions can help students develop a strong moral compass and a deep understanding of their responsibilities as educators. In terms of Implementing Learning Content and Approaches, the expert's recommendations emphasized the need for questions that assess students' ability to tailor their teaching strategies to meet the diverse needs of their learners. By incorporating scenarios that require students to consider the characteristics and needs of their students, the try-out questions can help students develop a more student-centered approach to teaching and learning. The expert's feedback also highlighted the importance of Teaching Strategies Based on Learner Characteristics. By incorporating questions that evaluate students' ability to design and implement teaching strategies that cater to the diverse needs of their learners, the try-out questions can help students develop a more nuanced understanding of the complex needs of their students. This, in turn, will enable them to create more effective and engaging learning environments. Overall, the expert's recommendations were invaluable in strengthening the try-out questions and ensuring that they align with the key indicators of effective teaching and learning. By incorporating the expert's feedback, the try-out questions can help students develop the skills, knowledge, and attitudes needed to become effective and compassionate educators who can make a positive impact on the lives of their students.

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Table 1. Advanced question design

Question Analysis Materials	Number of Questions	Subject Matter Study Materials	Cognitive Level of Questions	Number of Simple Multiple Choice Questions	Number of Complex Multiple Choice Questions	Question Number
Strategies for Creating a Safe and Comfortable Learning Environment for Students	2	Acid-Base Titration	Applying (C3)	1	0	1
		Precipitation Titration	Applying (C3)	1	0	2
Effective Student-Centered Learning	5	Precipitation Titration; Analysis of Metal Ions in Solution	Analyzing (C4)	1	0	3
		Precipitation Titration; Analysis of Metal Ions in Solution	Applying (C3)	1	0	4
		Precipitation Titration; Analysis of Metal Ions in Solution	Evaluating (C5)	1	0	5
		Complexometric Titration; Proximate Analysis	Evaluating (C5)	1	0	6
		Complexometric Titration; Proximate Analysis	Analyzing (C4)	1	0	7
		Planning for Solid Sampling	Applying (C3)	0	1	

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Continous **Table 1.** Advanced question design

Question Analysis Materials	Number of Questions	Subject Matter Study Materials	Cognitive Level of Questions	Number of Simple Multiple Choice Questions	Number of Complex Multiple Choice Questions	Question Number
Student-Centered Assessment, Feedback, and Reporting	4	Complexometric Titration; Fractionation Techniques of Petroleum and Their Uses; Water Sampling	Applying (C3)	0	1	8
		Microscope; Hydrocarbon Compounds; Sampling Procedure	Applying (C3)	1	0	9
		Microscope; Hydrocarbon Compounds; Sampling Procedure	Analyzing (C4)	1	0	10
		Sterilization of Equipment, Materials, and Space; Hydrocarbon Compounds; Preliminary Identification of River Water Samples	Analyzing (C4)	1	0	11
Behavior Reflecting Moral, Emotional, and Spiritual Maturity to Act in Accordance with the Teacher's Code of Ethics	4	Microbial Media Preparation, Waste Treatment, Water Sampling	Applying (C3)	1	0	12
		Microbial Media Preparation, Laboratory-Scale Biodiesel Production (Esterification), Water Sampling	Applying (C3)	1	0	13

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Continous **Table 1.** Advanced question design

Question Analysis Materials	Number of Questions	Subject Matter Study Materials	Cognitive Level of Questions	Number of Simple Multiple Choice Questions	Number of Complex Multiple Choice Questions	Question Number
Self-Development through Reflection Practices	2	Aseptic Technique; Laboratory-Scale Production of Opaque/Transparent Soap; Water Sampling	Applying (C3)	1	0	14
		Isolation and Inoculation Techniques; Laboratory-Scale Production of Liquid Soap; Viscometry	Analyzing (C4)	1	0	15
Student-Centered Learning	2	Microbial Staining Techniques; Global Issues and Technology in Analytical Chemistry; Electrical Conductivity of Solutions.	Analyzing (C4)	1	0	16
		Microbial Staining Techniques; Anion Analysis in Wastewater; Conductometry.	Analyzing (C4)	1	0	17
Collaborative Learning for Improvement	2	Microbial Regression Analysis; Biodiesel Production Demonstration in Class; Polarimetry	Evaluating (C5)	1	0	18
		Total Plate Count (TPC); Chemical Name, Chemical Formula, and Ionization Reaction Equation; Electrogravimetry	Analyzing (C4)	1	0	19
Involvement of Parents/Guardians and Community in Educational Process	2	MPN (Most Probable Number); Esterification of Acetic Acid and Alcohol; Paper Chromatography	Applying (C3)	1	0	20
		Most Probable Number (MPN); Proximate Analysis; Viscometry	Evaluating (C5)	1	0	21

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Continous **Table 1.** Advanced question design

Question Analysis Materials	Number of Questions	Subject Matter Study Materials	Cognitive Level of Questions	Number of Simple Multiple Choice Questions	Number of Complex Multiple Choice Questions	Question Number
Professional Engagement and Networking for Enhanced Learning	2	Bonferroni Test; Organic Chemistry; Spectrometry Methods	Applying (C3)	0	1	22
		Uji Bontery; Kimia Unsur; Pengoperasian UV-Vis	Analyzing (C4)	0	1	23
Implementing Learning Content and Approaches	4	Coliform and Salmonella Bacteria Examination; Ash and Mineral Analysis; Atomic Absorption Spectroscopy	Applying (C3)	0	1	24
		Coliform and Salmonella Bacteria Testing; Qualitative Analysis of Cations and Anions; Fourier Transform Infrared Spectroscopy	Analyzing (C4)	0	1	25
		GC (Gas Chromatography); HPLC (High Performance Liquid Chromatography.	Applying (C3)	0	1	26
Teaching Strategies Based on Learner Characteristics	5	Metal Element Analysis	Applying (C3)	0	1	27
		Metal Compound Analysis	Analyzing (C4)	1	0	28
		Study of Flame Photometry	Applying (C3)	1	0	29
		Chemical Industrial Processes	Creating (C6)	1	0	30
		HPLC Learning Strategies	Evaluating (C5)	1	0	31

Continous **Table 1.** Advanced question design

Question Analysis Materials	**Number of Questions**	**Subject Matter Study Materials**	**Cognitive Level of Questions**	**Number of Simple Multiple Choice Questions**	**Number of Complex Multiple Choice Questions**	**Question Number**
Curriculum Application in Teaching and Learning	4	Study of UV-Vis Spectroscopy	Analyzing (C4)	1	0	32
		Learning UV-Vis Spectrometry	Analyzing (C4)	1	0	33
		Applications of UV-Vis Spectrometry in Chemical Analysis	Applying (C3)	0	1	34
		UV-Vis Spectrometry Applications in Chemistry	Applying (C3)	0	1	35

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Table 2. Recommended items for revision

No.	Try-Out Questions	Expert Recommendation
7	In a learning activity on planning solid sampling, a teacher designs several activities as follows: Showing a simulation video of solid food sampling using standard sampling tools. Providing interactive digital modules that can be accessed through student devices. Asking students to read textbooks without additional explanation. Using an online quiz application to test students' understanding after practice. Assigning students to draw sampling tools from memory without visual references. Based on these activities, which ones demonstrate adaptive use of ICT (Information and Communication Technology) in learning? A. 1, 2, and 3 B. 2, 3, and 5 C. 1, 2, and 4 D. 1, 4, and 5 E. 3, 4, and 5 Scoring guidelines Answer Score C = 1 Other than C = 0	Based on the activities, select all the activities that demonstrate adaptive use of ICT and support the achievement of learning objectives.

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Continous **Table 2.** Recommended items for revision

No.	Try-Out Questions	Expert Recommendation
12.	A teacher is guiding students in a microbe media preparation activity. When the teacher discovers that a student is intentionally mixing materials without following procedures and mishandling laboratory equipment, the teacher feels that this action is not only hazardous but also shows a lack of responsibility. What is the most appropriate step for the teacher based on moral principles and their belief in God Almighty? A. Let it be so that the student learns from the consequences of their actions. B. Reprimand firmly and explain that laboratory practice is a trust of knowledge that must be preserved, and it is a form of gratitude to God for the ability to think and work. C. Immediately stop the entire class activity so the student learns a lesson. D. Give physical punishment so the student does not repeat the mistake. E. Move the student to another class without explaining their mistake. Scoring guidelines Answer Score B = 1 Other than B = 0	Scolding the student firmly and emphasizing the significance of laboratory safety as an academic trust that needs to be upheld, and as a way to express gratitude to God for the abilities bestowed upon them, followed by guiding them to rectify their errors.

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Continous **Table 2.** Recommended items for revision

No.	Try-Out Questions	Expert Recommendation
17.	In the practice of analyzing anions in wastewater samples, the teacher divides the students into groups and gives them the freedom to choose the analysis method (e.g., qualitative testing or chromatography). However, one student wants to try a different method that is not commonly used, and they have studied it independently. What is the teacher's attitude that best reflects appreciation for students' rights in learning? A. Rejecting the student's proposal because it does not align with the Lesson Plan (RPP) that has been prepared. B. Asking students to follow general guidelines only for the sake of time efficiency. C. Allowing students to try the method separately without official assessment. D. Accepting the student's initiative, discussing it together, and giving them the opportunity to try it while still considering safety and learning objectives. E. Ignoring the student's desire because it is considered too complicated. Scoring guidelines Answer Score D = 1 Other than D = 0	D. Accept the student's initiative, discuss it together, and provide an opportunity to try it while considering the aspects of safety and achievement of learning objectives.

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Continous **Table 2.** Recommended items for revision

No.	Try-Out Questions	Expert Recommendation
24	In designing a lesson about testing for coliform bacteria and Salmonella, a teacher of Analytical Chemistry wants to ensure that students understand the logical sequence of concepts and procedures. The teacher organizes the material as follows: 1. Explaining the general principles of microbiology and the role of indicator bacteria in food safety. 2. Presenting the workflow of the MPN test for coliform and selective media for Salmonella. 3. Providing context for the application of microbial testing in water and food quality control. 4. Starting the lesson with practice questions without explaining the basic concepts. 5. Connecting laboratory test results with quality standards from food regulatory agencies. Which of the following reflects the implementation of a relevant knowledge structure and sequence for learning? A. 1, 2, dan 3 B. 2, 3, dan 5 C. 1, 4, dan 5 D. 3, 4, dan 5 E. 2, 4, dan 5 Scoring guidelines Answer Score A = 1 Other than A = 0	It would be better if the type of special needs student is specified, such as visually impaired, hearing impaired, etc., so that the answer choices can be tailored accordingly, and the strategies provided will differ.

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Continous **Table 2.** Recommended items for revision

No.	Try-Out Questions	Expert Recommendation
30	In learning about chemical industrial processes, a teacher has students with special needs. What learning strategy is most suitable to ensure that all students can understand the concept of industrial distillation inclusively? A. Instructing students to copy the entire distillation process from the blackboard without additional explanation. B. Providing general reference books without modification or adaptation. C. Showing a video of the industrial process without oral or written explanation. D. Assigning students to read technical articles in a foreign language without guidance. E. Providing a model of the distillation apparatus that can be touched or manipulated, and giving explanations that are easy to understand both verbally and visually. Scoring guidelines Answer Score E = 1 Other than E = 0	The correct answer should be: 1, 2, 3, 5 is valid by changing the narrative 5 to: 5. Reporting laboratory test results to the head of the food regulatory agency.

DOI: https://doi.org/10.17977/um026v11i12026p001

Table 3. Solved Try-Out Questions Based on the Recommendations

No.	Try-Out Questions
7	In a lesson on planning solid sampling, a teacher designs the following activities: 1. Screening a video simulation of solid food sampling using standard sampling equipment. 2. Providing interactive digital modules accessible via students' devices. 3. Asking students to read textbooks without additional explanation. 4. Utilizing an online quiz application to assess students' understanding after practical exercises. 5. Assigning students to draw sampling equipment from memory without visual references. Based on these activities, choose all the activities that demonstrate adaptive use of ICT (Information and Communication Technology) in learning and support the achievement of learning objectives? A. 1, 2, and 3 B. 2, 3, and 5 C. 1, 2, and 4 D. 1, 4, and 5 E. 3, 4, and 5 Scoring guidelines Answer Score C = 1 Other than C = 0

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Continous **Table 3.** Solved Try-Out Questions Based on the Recommendations

No.	Try-Out Questions
12	A teacher is guiding students in a microbe media preparation activity. Upon discovering that a student is intentionally mixing materials without following procedures and mishandling laboratory equipment, the teacher feels that this action not only poses a risk but also demonstrates a lack of responsibility. What is the most appropriate action for the teacher to take based on moral principles and their faith in God? A. Let the student learn from the consequences of their actions. B. Reprimand the student firmly and explain the importance of laboratory safety as a trust (amanah) that must be maintained, and a form of gratitude to God for the abilities given, then guide them to correct their mistakes. C. Immediately stop the entire class activity to make the student regret their actions. D. Administer physical punishment to prevent the student from repeating the mistake. E. Transfer the student to another class without explaining their mistake. Scoring guidelines Answer Score B = 1 Other than B = 0

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Continous **Table 3.** Solved Try-Out Questions Based on the Recommendations

No.	Try-Out Questions
17	In the practice of analyzing anions in wastewater samples, the teacher divides the students into groups and gives them the freedom to choose the analysis method (e.g., qualitative testing or chromatography). However, one student wants to try a different method that is not commonly used, and they have studied it independently. What teacher attitude best reflects appreciation for students' rights in learning? A. Rejecting the student's proposal because it does not align with the prepared lesson plan. B. Asking the student to follow general instructions for the sake of time efficiency. C. Allowing the student to try the method separately without official assessment. D. Accepting the student's initiative, discussing it together, and providing an opportunity to try it while considering aspects of safety and achievement of learning objectives. E. Ignoring the student's desire because it is considered too complicated. Scoring guidelines Answer Score D = 1 Other than D = 0

DOI: https://doi.org/10.17977//um026v11i12026p001

Continous **Table 3.** Solved Try-Out Questions Based on the Recommendations

No.	Try-Out Questions
24	In designing a lesson on testing for coliform bacteria and Salmonella, an Analytical Chemistry teacher wants to ensure that students understand the logical sequence of concepts and procedures. The teacher organizes the material as follows: 1. Explaining the general principles of microbiology and the role of indicator bacteria in food safety. 2. Presenting the workflow of the MPN test for coliform and selective media for Salmonella. 3. Providing context for the application of microbial testing in water and food quality control. 4. Starting the lesson with practice questions without explaining the basic concepts. 5. Reporting laboratory test results to the head of the food regulatory agency. Which of the following best reflects the implementation of a relevant knowledge structure and sequence for learning? A. 1, 2, dan 3 B. 2, 3, dan 5 C. 1, 4, dan 5 D. 3, 4, dan 5 E. 2, 4, dan 5 Scoring guidelines Answer Score A = 1 Other than A = 0

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Continous **Table 3.** Solved Try-Out Questions Based on the Recommendations

No.	Try-Out Questions
30	In learning about chemical industrial processes, a teacher has students with special needs who are visually impaired. What learning strategy is most suitable to ensure that all students can understand the concept of industrial distillation inclusively? A. Asking students to note down the entire distillation process from the blackboard without additional explanation. B. Providing general reference books without modification or adaptation. C. Showing a video of the industrial process without oral or written explanation. D. Assigning students to read technical articles in a foreign language without guidance. E. Providing a distillation apparatus model that can be touched or manipulated, and giving explanations that are easy to understand verbally and visually. Scoring guidelines Answer Score E = 1 Other than E = 0

Table 3 presents the revised try-out questions that have been modified according to the expert's expectations. The revisions are highlighted in bold text, indicating the changes made to improve the clarity and effectiveness of the questions. The results is listed in the link and presented as Bahasa as follows: https://tinyurl.com/yeyrzt2t. This revision process has resulted in try-out questions that are more easily understood by students, enabling them to answer the questions with greater confidence and accuracy. The revised questions have been designed to be more precise and relevant to the needs of PPG students in chemical analysis. By incorporating the expert's feedback, the questions now better reflect the key concepts and skills required in the field of chemical analysis. This will enable students to demonstrate their knowledge and understanding of the subject matter more effectively. The use of bold text to highlight the revisions made to the questions provides a clear visual indication of the changes that have been implemented. This transparency will help students to focus on the key areas of the questions and understand what is being assessed. By making the questions more accessible and easier to understand, the revised try-out questions will help to reduce student anxiety and promote a more positive assessment experience. The revised try-out questions will also enable educators to assess student knowledge and understanding more accurately. By using questions that are clear and concise, educators can gain a more accurate picture of student strengths and weaknesses, and provide targeted support and feedback to help students improve.

Overall, the revised try-out questions represent a significant improvement over the original questions. By incorporating the expert's feedback and making the questions more accessible and easier to understand, the revised questions will help to promote a more positive and effective assessment experience for PPG students in chemical analysis.

Expert Validation Results and Comparison with Other Try-out Questions.

Figure 2 presents a comparison of expert feedback for three sets of try-out questions: Chemical Analysis https://tinyurl.com/est8zuew, and Chemical Engineering https://tinyurl.com/mvmrfrbb . The results show that the Chemical Analysis set questions have the lowest percentage of errors, with only 5% of the questions requiring revision. In contrast, the Chemistry set questions had a 10% error rate, while the Chemical Engineering set questions had a significantly higher error rate of 24%. The low error rate for the Chemical Analysis set questions indicates that the expert had a high level of confidence in the quality and effectiveness of these questions. This is likely due to the careful design and development of the questions, which took into account the specific needs and requirements of PPG students in chemical analysis. The expert's feedback suggests that the Chemical Analysis set questions are well-suited for assessing student knowledge and understanding in this field.

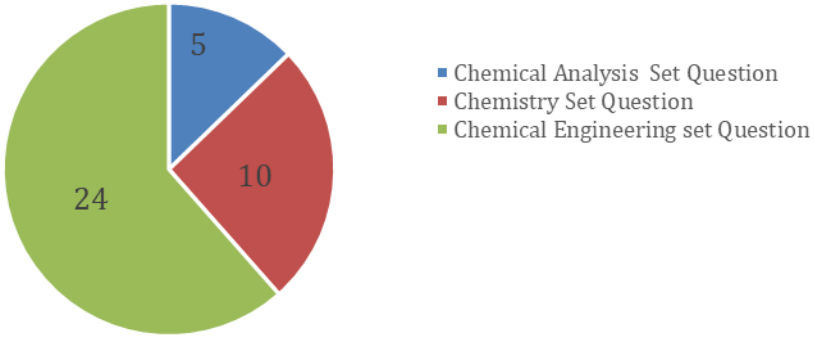

Figure 2. Validity composition (percent) based on suggestions

In contrast, the higher error rates for the Chemistry and Chemical Engineering set questions suggest that these questions may require further revision and refinement. The expert's feedback may have identified areas where the questions were unclear, ambiguous, or not aligned with the learning objectives. By revising these questions, educators can improve the validity and reliability of the assessment and ensure that students are being evaluated fairly and accurately.

The results of this study highlight the importance of expert feedback in the development of high-quality assessment questions. By soliciting feedback from experts in the field, educators can identify areas for improvement and make targeted revisions to the questions. This can help to ensure that the assessment questions are valid, reliable, and effective in measuring student knowledge and understanding. Overall, the results of this study demonstrate the value of careful design and development of assessment questions, as well as the importance of expert feedback in ensuring the quality and effectiveness of these questions. The Chemical Analysis set questions, with their low error rate and high level of expert confidence, provide a model for the development of high-quality assessment questions in other fields.

The try-out test was administered to two PPG students majoring in chemical analysis, and the results showed scores of 63 and 65. Following the try-out, the question developer provided a detailed discussion of the weaknesses and areas for improvement, focusing on the questions that proved challenging for the students. This discussion aimed to help the students better understand the concepts and improve their performance. The discussion of the try-out results highlighted the areas where the students struggled the most, which were primarily in the more difficult questions. By identifying these areas, the question developer could provide targeted support and guidance to help the students overcome their weaknesses. This approach enabled the students to learn from their mistakes and develop a deeper understanding of the subject matter.

The try-out test and subsequent discussion were designed to prepare the PPG students for the final graduation exam. By simulating the actual exam experience and providing feedback

on their performance, the question developer aimed to help the students feel more confident and prepared for the challenges they would face. This approach is particularly important for students who aspire to become teachers at SMK analysis schools, where they will be expected to demonstrate a high level of competence in chemical analysis. The results of the try-out test also provided valuable insights for the question developer. By analyzing the students' performance, the developer could identify areas where the questions may need to be revised or improved. This feedback loop is essential for ensuring that the assessment questions are valid, reliable, and effective in measuring student knowledge and understanding.

Overall, the try-out test and discussion were a valuable experience for the PPG students. By identifying areas for improvement and providing targeted support, the question developer helped the students to develop a deeper understanding of chemical analysis and prepare them for the challenges they would face in their future careers as teachers. The try-out results for PPG students majoring in Chemical Analysis at SMK proved to be a crucial factor in their success, with a remarkable 100% pass rate in the PPG exam. This outstanding achievement can be attributed to the effective preparation and assessment provided by the try-out, which helped identify and address areas of weakness, ultimately leading to the students' success. The try-out's impact on the students' performance highlights the importance of thorough preparation and assessment in achieving academic success.

The results of the study indicate that the try-out questions were effective in enhancing students' understanding of chemistry analysis. The students' performance on the try-out questions showed a significant improvement in their ability to analyze and solve problems related to chemistry. This is consistent with the findings of previous studies, which have shown that well-designed assessment tools can improve student learning outcomes. The try-out questions were also found to be effective in identifying areas where students need improvement. The results showed that students struggled with abstract concepts in chemistry, such as electrochemistry, analytical techniques, and chemical kinetics (Habiddin & Page, 2021).

The study also found that the try-out questions had a positive impact on the graduation outcomes of PPG students. The students who performed well on the try-out questions were more likely to graduate with a strong understanding of chemistry analysis. This is consistent with the findings of Darling-Hammond (2006), who noted that teacher preparation programs that focus on developing teachers' subject matter knowledge and pedagogical skills can improve student learning outcomes. Overall, the study demonstrates the importance of developing high-quality assessment tools in teacher education programs. The use of try-out questions can help identify areas where students need improvement and provide valuable insights into the design of assessment tools that support student learning. Overall, the study demonstrates the importance of developing high-quality assessment tools in teacher education programs. The use of try-out questions can help identify areas where students need improvement and provide valuable insights into the design of assessment tools that support student learning.

Conclusion

The development of try-out questions for PPG students in Chemical Analysis has shown promising results, with a high level of validity and effectiveness in assessing students' knowledge and skills. The integration of Question Analysis Materials, Subject Matter Study Materials, and Cognitive Level of Questions has enabled the creation of relevant and challenging questions that align with the learning objectives and outcomes of the SMK Chemistry analysis curriculum. The expert feedback and revision process has further improved the quality of the questions, resulting in a low error rate and high confidence in the assessment results. The 100% pass rate for PPG students in Chemical Analysis demonstrates the effectiveness of the try-out questions in preparing students for the actual PPG exam. Overall, this study highlights the importance of careful design and development of assessment questions in ensuring the validity and reliability of assessment results. To enhance the robustness of the try-out questions, it is recommended to combine and test them with other universities, allowing for a quantitative analysis with a broader population.

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