# Voices from the Classroom: Students' Perspectives on ARIPSA's Role in Assessing Problem-Solving Skills

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**Abstract.** To address the complexities of the 21st century, it is essential for society to be armed with relevant competencies, of which problem-solving skills are paramount. A comprehensive assessment that reflects their problem-solving acumen is necessary to gauge students' capabilities in this area. This study aims to elucidate the students' perceptions regarding the implementation of ARIPSA (Augmented Reality Integrated on Problem Solving Assessment). The chosen methodological approach for this research is descriptive quantitative, with a questionnaire serving as the primary instrument. Upon a detailed analysis of the data, it was observed that 86,54% of students expressed positive feedback toward the use of ARIPSA. This indicates that a vast majority of students believe in the efficacy and suitability of ARIPSA as a measure for assessing problem-solving skills.

**Keywords:** Constructivism, Development, Organic Chemistry II**,** Student's Work Sheet

## 1 Introduction

In view of the multifaceted challenges we face in today's age, it's crucial for communities to hone foundational skills, from critical reflection and innovative thinking to collaborative endeavors and articulate communication [1][2]. It's vital for learners to master these competencies to actively participate in the international arena [3][4]. Successfully navigating complex problems is a key trait in our modern world, especially within the digital technology sector [3], [5]. As technology and communication grow globally, it demands a fluid approach to data and ever-changing situations [1], [6]. Research from a renowned U.S. entity suggests that fostering cognitive skills is pivotal to shaping an outstanding workforce. This includes capabilities like innovation, strategic choices, tackling challenges, picturing solutions, acquiring knowledge, and logical thought [1], [2], [7].

Physics is one of the fields of science that deals with how the world is investigated physically[8], [9]. This exploration delves into a broad spectrum of occurrences, from minute elements of matter to the vast stretches of the universe. In the realm of education, physics' reach surpasses mere rules and mathematical formulas[10], embracing advanced competencies like problem-solving, sharp analysis, logical deduction, and


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grasp of concepts. As such, the way we assess students holds paramount importance in the teaching of physics[11],[12]. Assessment enables educators to appraise the degree to which the predetermined learning outcomes have been attained and to gauge the efficacy of the instructional strategies employed[13]. In addition, assessments have the potential to offer valuable input for improvement. Moreover, the implementation of quality assessment strategies might serve as a catalyst for fostering the development of students' problem-solving skills. Hence, the evaluation of student performance holds significant importance in gauging the caliber and efficacy of the physics education process[12], [14], [15].

In the contemporary era characterized by digital advancements, technology has assumed a fundamental role within the realm of education. In today's digital age, technological tools have emerged as pivotal assets in measuring an individual's aptitude for addressing challenges, most notably during comprehensive appraisal phases. By weaving in the latest digital innovations, such as video capabilities, augmented visualization techniques (VR and AR), and fully immersive digital experiences, into our evaluation frameworks, we not only ensure a richer understanding of subjects but also pave the way for learners to flex their creative muscles[16]–[18]. Furthermore, these tools, when used effectively, can be instrumental in fostering an environment where students can collaboratively harness their skills, driving a more engaged and interactive learning experience[17], [19], [20]. The utilization of swift and adaptable answers in digital media-integrated assessments, specifically in the context of augmented reality (AR) such as ARIPSA (augmented reality integrated problem-solving assessment), offers an enhanced understanding of cognitive processes, particularly within the domain of problem-solving.

The integration of augmented reality (AR) technology into problem-solving assessments provides students with an immersive and interactive platform to engage in collaborative efforts when tackling physics test issues in group settings. Students utilize their smartphones to explore the outer environment and get information in order to address inquiries that are presented at different geographical points[17], [20]. The utilization of augmented reality (AR)-integrated problem-solving assessments facilitates engagement in physical activity and fosters social interactions in real-world settings. The application of ARIPSA in courses has been restricted thus far. In order to further its growth with diverse materials, it is crucial to gather feedback from students regarding the implementation of ARIPSA. This input will play a vital role in evaluating the following developing products.

## 2 Methodology

The study employs a quantitative descriptive research design, utilizing a survey methodology[21]. The descriptive quantitative research scheme is presented in Figure 1.

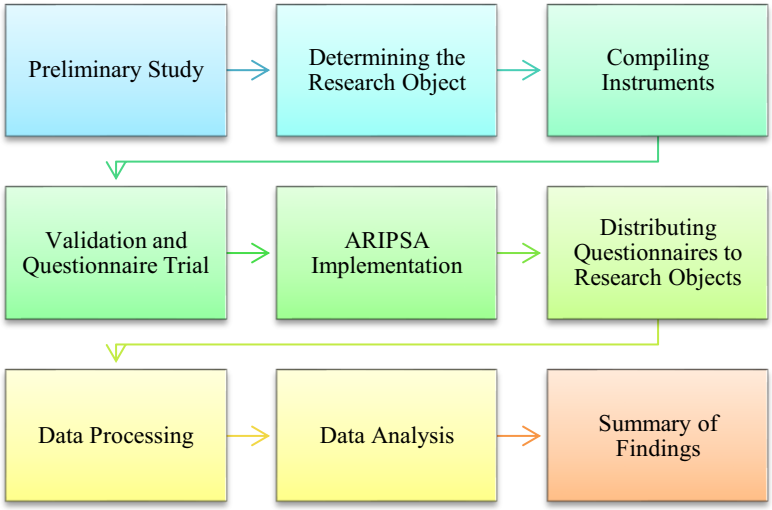


**Fig. 1** Stages of Survey Research

The utilized instrument is an online questionnaire comprising inquiries pertaining to students' reactions towards the implementation of problem-solving assessment in conjunction with the incorporation of digital media, specifically augmented reality (AR). The validity of the survey was assessed through the application of Pearson's bivariate correlation in a statistical analysis[19]. The resulting average value of the calculated r exceeded the critical value from the t-table, suggesting that all the survey questions are appropriate for utilization. In addition to conducting a validity test, the reliability of the survey questions was also assessed, revealing that the questions exhibit a high level of reliability. The participants in this research consisted of 22 students studying physics education at a private university located in Garut City. The selection of participants was conducted using a random sampling method. The questionnaire items are displayed in Table 1.

**Table 1.** Questionnaire items

| Indicator |
|---|
| Assists in comprehending the advantages associated with the resolution of problems encountered in daily existence. |
| Assisting in the development of the ability to comprehend complex issues and offer concise explanations. |
| Possessing the ability to engage in strategic problem-solving and decision-making processes. |
| ARIPSA demonstrates higher efficiency compared to conventional assessment methods. |
| Promotes the development of cognitive abilities necessary for advanced problem-solving. |
| This can be utilized in subsequent examinations featuring varying subject matter. |
| Assists in enhancing motivation towards test-taking. |
| The presence of aids facilitates the acquisition of technological skills. |
| Enhances the level of engagement in the test. |

The utilization of augmented reality (AR) visualization aids learners in comprehending and resolving the problems that are presented to them.

## 3 Result and Discussion

The ARIPSA (Augmented Reality Integrated Problem-Solving Assessment) was administered to the participants in this research investigation. Prior to the utilization of ARIPSA by the students, the instructor instructed the students to download the application and furnished them with instructions on its usage. Following their utilization of ARIPSA, the students were subsequently requested to complete a pre-prepared survey. The poll included inquiries pertaining to response indicators in relation to their usefulness, efficiency, and utility.

The present study has certain limitations due to its reliance on data obtained from participants through self-administered surveys. Nevertheless, the utilization of this data-gathering methodology has facilitated the acquisition of comprehensive data pertaining to students' encounters with ARIPSA. While it is acknowledged that not all participants offered exhaustive answers to open-ended questions, the analysis nonetheless enabled the identification of distinct patterns or themes in these responses and their correlation with the quantitative data gathered. Although a 100% response rate was not achieved, our team successfully conducted a comprehensive data analysis, yielding significant findings. The survey findings are visually depicted in the chart illustrated in Figure 1.

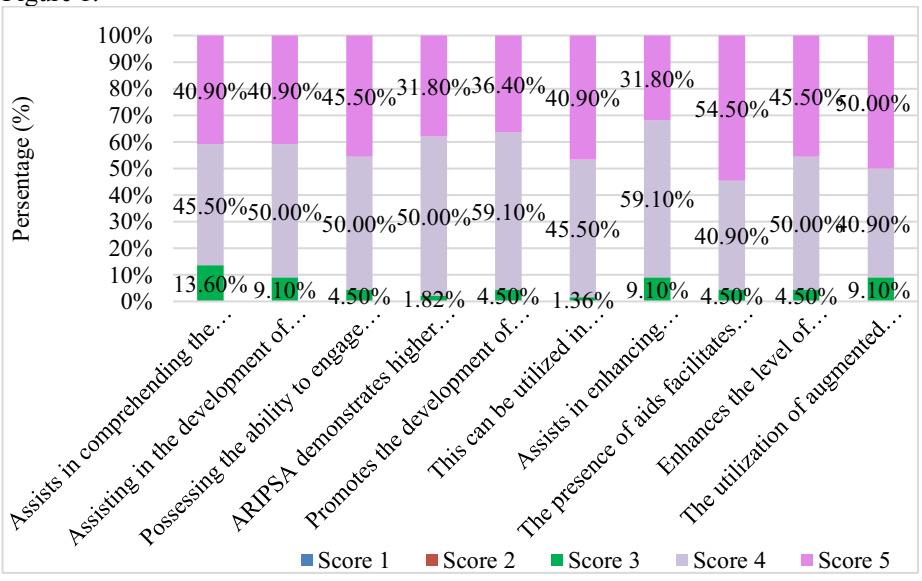


**Fig. 2** Percentage of Each Response in the Questionnaire

This bar chart displays the percentage of student responses regarding the use of ARIPSA for ten different indicators. Each indicator is rated on a scale of 1 to 5, and the

chart shows how often each score was given by respondents. According to the data presented in Figure 2, the question "*ARIPSA can help technology skills*" exhibits the highest score value of 54.50% among the indicators. This is due to the fact that, in the utilization of ARIPSA, students are required to acquire proficiency in a range of supplementary aspects, encompassing the abilities to download, install, and utilize apps[13], [19], [22]. This has the potential to cultivate students' eagerness to acquire knowledge and skills in using and navigating novel applications [23], particularly those that facilitate AR such as the MAKAR application.

The tenth indicator, titled "*AR helps facilitate students' understanding in solving presented problems*," exhibits the second-largest proportion of maximum scores among all indicators. In this indicator, it is observed that 50% of the students' responses indicated a score of 5, denoting a "*strongly agree*" sentiment. This suggests that the students perceive the augmented reality (AR) provided to be beneficial in enhancing their comprehension of the presented topic. Comprehending the situation at hand holds significance during the problem-solving process, as it facilitates the identification and implementation of effective solutions by pupils. Furthermore, gaining a grasp of the situation at hand can also serve to enhance students' analytical capabilities when it comes to problem-solving[11], [24]–[26].

There exist five indications, each with a maximum score percentage that ranges from 40% to 45%. The indicators encompass indicators 1, 2, 3, 6, and 9. The survey includes three indicator questions, namely questions 1, 2, and 3. These questions pertain to the substance of the ARIPSA and its relevance in facilitating problem-solving processes. Indicators 6 through 9 address elements pertaining to the efficacy of learning processes. Based on the analysis of student responses, it is evident that a significant proportion of students hold the belief that problem-solving abilities are of utmost importance for students in the current era. This perspective is rooted in the recognition that such skills serve as essential competencies for navigating the challenges inherent in a rapidly evolving society[1], [4], [7], [27]. Through consistent practice in addressing basic problems, students will develop a propensity for critical and analytical thinking, as well as creative problem-solving, enabling them to arrive at optimal solutions for the challenges they encounter[11], [24].

Regarding indicators six and nine, students expressed favorable answers towards the practice of utilizing ARIPSA again in subsequent exams involving distinct materials. According to the feedback provided by students, it was found that the utilization of ARIPSA was perceived as more engaging and captivating compared to traditional assessment methods. The fourth indication, titled "*ARIPSA demonstrates higher efficiency compared to conventional assessment methods*," exhibits the lowest maximum score percentage among all indicators. The seventh sign pertains to the role of test-taking motivation enhancement. Although it cannot be concluded that ARIPSA lacks efficiency and fails to promote motivation during testing, it is worth noting that certain students have challenges in accessing the platform, leading them to assign a rating of 4 instead of 5, as indicated by their comments. Based on the survey results and corresponding graphs, it has been demonstrated that most respondents, above 50%, assigned a score of 4 to indicators 4 and 7. Specifically, the percentages for these indications were recorded as 50% and 59.10%, respectively.

According to the average response from the students, 86.54% of them believe that ARIPSA is advantageous, effective, and in line with their needs. Additionally, students made a ton of recommendations regarding the use of ARIPSA. Included in the recommendations were proposals pertaining to a broader array of resources, an elongation of the temporal span allotted for problem-solving, and the provision of more comprehensive guidelines for operating ARIPSA. In addition to receiving ideas, students have also reported encountering difficulties with the use of ARIPSA, specifically pertaining to the non-appearance of videos for certain pupils. The potential cause of this issue could be attributed to the presence of mobile devices that are not compatible with the system requirements or the utilization of inadequate internet connections[6], [17], [18], [20], [28], [29]. However, it was shown that students experienced a greater sense of enjoyment and engagement while utilizing Augmented Reality Integrated Problem-Solving Activities (ARIPSA), particularly when working together in groups. In the comment area, students expressed that the examination became increasingly engaging due to its resemblance to augmented reality (AR) games, which necessitated the utilization of several senses in order to successfully do the assigned task[24], [30].

## 4 Conclusion

Based on the data collected, it can be inferred that a significant proportion of students exhibited favorable attitudes toward the implementation of ARIPSA, as evidenced by their positive responses regarding its usability, efficiency, and alignment with their needs. The students additionally expressed their subjective experiences while utilizing ARIPS, delineated the obstacles encountered, and highlighted the salient features they found beneficial, such as reliable internet connectivity and smartphones specifically engineered to support AR apps.

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