The Integration of Auditory Intellectual Repetition Model Through the Development of Video Learning Media in Chemistry Practices Aa a Strategy for Adapting Technology in Learning

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Abstract: This study aims to determine the validity of practicum-based learning video media integrated with the Auditory, Intellectually, Repetition (AIR) model and to describe students' learning outcomes. The research method employed is developmental research using the ADDIE development model, which consists of the stages of Analysis, Design, Development, Implementation, and Evaluation. The research procedure includes the preparation stage, implementation stage, and final stage. The results of this study indicate that the developed media, based on validation by subject-matter experts in stages 1, 2, and 3, are categorized as very valid for field implementation, with a validation percentage of 95.6%. Furthermore, the feasibility of the learning media is also classified as very valid, indicating that it is appropriate for use in the learning context. The learning outcomes in the knowledge aspect obtained from 15 students after participating in the learning process are categorized as complete, with an average score of 85.66, which exceeds the minimum mastery criterion (MMC) of 70. This result is attributed to students' active participation and full attention during the learning process, enabling them to understand the material well and successfully complete the given test. Overall, students' learning outcomes are declared complete, with an average score of 85.7, which meets the school's minimum mastery criterion of 70.

Keywords: AIR models; Chemistry experiment; Development of learning video

Introduction

Education serves as the primary pillar for the development of human resources. The success of these resources is primarily determined by the quality of the education they receive. The quality of education has long been a central concern of the government; consequently, its implementation in schools emphasizes the development of effective teaching and learning methods aimed at improving student learning outcomes. Over time, the concept of educational quality has continued to evolve in response to the rapid advancements in science and technology. One of the significant challenges in chemistry education lies in students' difficulty in comprehending abstract concepts. Chemistry encompasses numerous theories and principles that are often difficult to understand solely through textbooks or teacher-centered instruction.

Often, students require hands-on experience or concrete visual cues to understand these concepts fully. Moreover, learning chemistry also requires practical skills to apply theoretical knowledge in the laboratory through experiments. Unfortunately, not all schools are equipped with adequate chemistry labs, which prevents students from gaining the hands-on experience necessary to conduct experiments. In this context,

conventional learning approaches are often insufficient to meet the educational needs for effective chemistry learning (Asni et al., 2020). Therefore, it requires an innovative and interactive approach that fully integrates theoretical concepts and practices. One of the efforts that can be undertaken to address learning problems is the development of practicum-based instructional video media. Video media are able to present practicum procedures in a visual, structured, and easily understandable manner, thereby helping students comprehend experimental procedures, underlying concepts, and the implementation of laboratory safety practices. In addition, the flexible nature of video media enables students to access and study the material independently at any time and to repeat it according to their individual learning needs. This condition is in line with the demands of 21st-century learning, which emphasize flexibility, learner autonomy, and the optimal use of technology. The continuous growth of educational technology in the 21st century has profoundly reshaped instructional approaches, especially in science education. In chemistry learning, the incorporation of technology-enhanced instructional media plays a crucial role in fostering conceptual understanding, laboratory competencies, and scientific literacy. Nevertheless, many schools still depend largely on traditional teaching strategies and restricted practicum activities, which often lead to low levels of student participation, limited conceptual mastery, and underdeveloped practical skills.

Learning media are among the key resources that can assist teachers in presenting lessons effectively, ensuring that information is delivered clearly and in a more varied manner. (Nazar et al., 2020). Apart from that, the use of learning media can capture students' attention and, in turn, enhance their motivation to learn. (Lubis & Ikhsan, 2015). Incorporating such media in the classroom helps to create an engaging and effective learning environment, thereby increasing the students' enthusiasm during class sessions. Furthermore, learning media also serves as a medium of communication that stimulates students' attention, cognitive processes, and interest in the subject matter (Harahap, 2015). The use of learning media can significantly support the overall learning process, making studying more engaging and enjoyable, and helping students better absorb the lessons (Hayanum et al., 2023). A video-based learning medium presenting a practicum experiment on the concept of acids and bases.

A video-based learning medium integrated with the Auditory Intellectually Repetition (AIR) Model, which combines visuals, music, and sound to illustrate lessons regarding acids and bases effectively (Komisia, Tukan, & Uron Leba, 2022). This research is conducted in schools with inadequate laboratory facilities and equipment. It is expected that the study will offer an alternative learning approach that enables more effective delivery of conceptual understanding to students. Learning videos serve as an appropriate medium for use in various instructional settings, including classrooms, small groups, and large groups. (Lestari et al., 2021). It is expected that the development of this learning medium will enable students to understand the concepts more effectively. This is because videos can be replayed at any time according to students' needs (Subandi et al., 2023).

The Auditory, Intellectually, and Repetition (AIR) model can enhance the students' mastery of concepts and factual knowledge. This learning approach emphasizes three key components: (1) Auditory, which involves listening, paying attention, expressing opinions, and providing feedback; (2) Intellectual, which requires investigation, identification, problem-solving, and application; and (3) Repetition, which entails the continuous deepening and expansion of knowledge (Saharuddin et al., 2021). The use of the AIR method in learning must be integrated in a particular fashion so that, in the end, it will be able to create a fun and conducive learning atmosphere (Komisia et al., 2022). The benefits of the AIR learning method are as follows; (1) Students are more actively involved in the learning process, (2) Students are given more opportunities to use the knowledge obtained comprehensively, (3) Students with lower academic abilities can be able to respond to the learning materials in their own way ; (4) Students are given more opportunities to actively seek problem solving methods to problems they face (Amelia, 2017). Video learning media is a set of components or media that can display images and sound simultaneously. Video media encompasses everything related to software and hardware, specifically objects that can be observed using the five senses. The use of learning media can improve students' critical thinking skills (Sukasno et al., 2023). Educational videos as teaching materials aim to clarify and simplify the delivery of messages, ensuring they are not overly verbalistic. They overcome limitations in terms of time, space, students' sensory abilities, and infrastructure (Hobri et al., 2021).

This learning model emphasises on auditory learning, which means learning through listening, paying attention, expressing opinions, and responding; intellectual learning, which means learning by investigating, identifying, discovering, solving problems, and applying; as well as repetition, which means deepening, expanding, and consolidating knowledge by training students through assignments, quizzes, and so on (Komisia et al., 2022). Based on interviews conducted with Advent High School's Chemistry teacher, it was discovered that chemistry practicum lessons were undertaken rarely due to the

limited supply of equipment and the poor state of the laboratory building (Mikropoulos & Natsis, 2011). This is certainly very detrimental to students. Based on this review, the use of practical-based video learning media has become an alternative for chemistry teachers to utilize as a learning medium, allowing students to follow the practical process through videos that can be viewed repeatedly, thereby increasing their knowledge. Based on the Cognitive Theory of Multimedia Learning (CTML), meaningful learning occurs when instructional resources combine visual, verbal, and auditory components in ways that minimize cognitive overload and facilitate active mental processing (Mayer, 2005). Recent empirical studies have shown that effectively designed educational videos significantly enhance learners' memory retention, conceptual comprehension, and problem-solving abilities, particularly in scientific disciplines characterized by complex experimental procedures and abstract concepts (Fiorella & Mayer, 2018). Consequently, practicum-oriented learning videos represent a practical and effective approach to addressing laboratory limitations while preserving instructional quality and experimental realism. In addition, the framework of active learning and cognitive engagement underscores the critical role of students' intellectual participation in the construction of knowledge. Contemporary instructional approaches emphasize inquiry-based activities, analytical reasoning, and reflective practices to support deeper understanding and sustained learning outcomes (Freeman et al., 2014). In line with these principles, the Auditory, Intellectually, Repetition (AIR) learning model fosters auditory engagement, cognitive involvement, and systematic reinforcement. Empirical evidence indicates that instructional strategies incorporating repetition and cognitive activation substantially improve conceptual understanding, learner motivation, and critical thinking skills (Dunlosky et al., 2013).

The main problems in this study are to examine the validity of chemistry practicum-based video media that integrates auditory, intellectual, and repetition models, and to investigate the student learning outcomes achieved through the use of practicum-based video media that incorporates these models. On the other hand, the objectives of this study are to describe the validity of laboratory-based video learning media that integrate auditory, intellectual, and repetitive learning approaches and to examine student learning outcomes.

Method

This research was conducted in the second semester of the 2024/2025 academic year at SMA Advent in Kupang Regency. A Research and Development (R&D) methodology based on the ADDIE model, encompassing the stages of analysis, design, development, implementation, and evaluation, was adopted. This framework was utilized to design and assess the effectiveness of instructional video media.

The study involved all 25 Grade XI science students at SMA Advent as the research population, with total sampling applied. Data collection tools included a laptop, smartphone, and chemistry laboratory apparatus. The research materials consisted of instructional resources, student worksheets (LKPD), and chemical reagents used in laboratory activities. This research is developmental in nature, utilizing the ADDIE development model.

The subject of this research is the development of learning tools in the form of practical-based video learning media integrated with the AIR model, which was tested on 11th-grade students at Advent High School, Kupang Regency, East Nusa Tenggara Province. The variables of this research are the validity and learning results of the students. The data-gathering methods used in this research are designed to ensure validity. The data collection techniques employed in this study includes validation and testing methods. The instruments used in this study were a Video Learning Media Validation Sheet and a Student Learning Outcome Test Sheet.
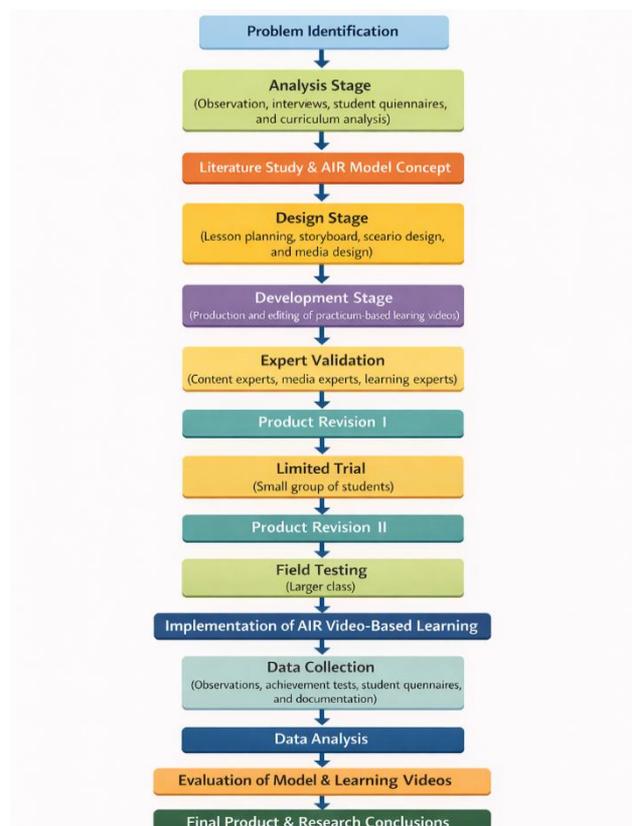

Figure 1. Research procedure

This research uses the ADDIE model development approach, which stands for Analysis, Design, Development, Implementation, and Evaluation (Kawete et al., 2022). The analysis stage aims to determine the need for developing video learning media, encompassing curriculum analysis, learning media analysis, and material analysis. During the design stage, researchers develop video production scenarios, create video scripts, design the instruments to be used, and produce videos. In the development stage, the developed media is validated in stage I by experts and then revised based on input from experts or specialists. After revision, the second and third stages of validation are carried out. Next comes the implementation stage, which involves carrying out activities in the field. The final part of the ADDIE model is the evaluation stage. This stage aims to evaluate all obstacles or constraints encountered during the research activities. The research procedure is illustrated as in Figure 1.

The assessment data were then analyzed descriptively (Chang et al., 2022). To analyze the validity of the developed learning media, a descriptive analysis was conducted, where the assessment results of experts or practitioners were adjusted to the assessment criteria of the learning tool to categorize them as valid/suitable for implementation in the field. The analysis of student learning outcomes employed a qualitative descriptive method, utilizing the percentage of agreement formula (Roaché, 2017). To analyze the student's learning outcomes, a qualitative descriptive analysis was conducted using the percentage of agreement formula (Anderson, 2014). Experts then validated the validity of the developed learning video media. Tool validation is the score obtained from experts/validators. This component was then analyzed descriptively. In this study, the passing grade was defined as the average score (p) from the assessment results of experts and practitioners, which was then adjusted to the learning tools assessment criteria, as shown in Table 1.

Table 1. Assessment Catogery Criteria (Aliyah et al., 2025)

Score Intervals	Validity Category
3.6 ≤ P < 4.0	Highly Valid
2.6 ≤ P < 3.5	Valid
1.6 ≤ P < 2.5	Invalid
1.0 ≤ P < 1.5	Highly Invalid

To obtain learning outcomes, the equation used to calculate the final score for the knowledge aspect is as follows:

$$NKI3 = \frac{1 \times NK + 1 \times NT + 2 \times NU}{4} \qquad (1)$$

The results of these calculations were then assessed using the evaluation criteria presented in Table 2 below.

Table 2. Evaluation Category Criteria

Score	Category
76-100	High
56-75	Medium
40-55	Low
0-39	Very Low

Result and Discussion

To obtain expert validation results on video media developed the Validation Sheet instrument was used. Afterwards the validation process of the material aspects of the tools was conducted in three rounds, with the validation results described as follows: in accordance with the basic competencies for the material aspect in the learning video, the percentage obtained for the first validation stage was 77%; for the second validation stage, the obtained percentage was 87%; and for the third and final stage, the final obtained percentage was 100% (Matovu et al., 2023). For the learning objectives aspect, which were clearly conveyed in the learning video, the percentage obtained in all three stages was 100%. For the aspect of topics with material descriptions in the learning video, which were all deemed appropriate, the percentage obtained in the three validation stages were 100%. In terms of images presented in the instructional video, which aligned well with the material, it achieved a 100% success rate in all three rounds of the validation stage. In terms of how it can provide new knowledge for students, the materials presented videos achieved a 100% success rate in all three rounds of validation testing. In terms of media selection aspect in accordance with the student's characteristics, it achieved a success rate of 76% in the first round of validation testing, then an 89% in the second round, and finally it achieved a success rate of 100% at the final round. In terms of learning objectives, these were clearly conveyed in the learning videos, with validation stages 1, 2, and 3 all achieving a 100% success rate. Based on the results of validation stages 1, 2, and 3, the developed video media was classified as highly valid for use in the field, achieving a percentage of 95.6%.

Media validation is a crucial procedure in evaluating the quality of a learning tool product. This process enables the extent to which a learning medium can be considered effective in supporting the learning process. The validation stage of the chemistry learning media draft, utilising the AIR model developed and validated by experts and practitioners, is a crucial step in evaluating the eligibility of the learning media. The validation of learning media encompasses multiple aspects, which includes usability, navigation system,

visual design, and learning content. The usability aspect encompasses how effective the learning designs are able to convey information and support the overall achievement of the learning objectives. Apart of that, the quality of the contents is also a main focus of the media validation process. Effective learning designs must be able to organize information systematically, present relevant and informative content, and use language and communication channels that is clear and easily understood by the target audience. Therefore, the media validation process involves evaluating the learning design, content, language, and communication used in the learning media. The results of the validation process for the video media developed based on the AIR model indicates that this learning medium is highly suitable for usage. Based on to the expert validation results, the suitability of this learning media is in the highly valid category. Kurnia et al. (2019) which also found that the level of suitability of the learning media was in the highly valid category and therefore suitable for use. The quality of a good learning media can be viewed from several aspects, including technical aspects such as content or substance, as well as the visual design used. In this study, all of these aspects have been carefully considered. However, there is a small note from the experts for revision, namely that the images included in the learning media should be based on real conditions and local wisdom, and the concepts presented in the media must be accompanied by appropriate and adequate visual illustrations. Overall, the developed validation process is an essential step to ensure the quality and effectiveness of video media as a learning tool. Through this process, the strengths and weaknesses of the learning media can be identified, and recommendations for improvement can be provided to enhance its' quality. Therefore, the learning media validation is an integral part of the development and evaluation of practical and high-quality learning tools (Sitepu & Herlinawati, 2022).

Table 3. Knowledge Aspect Learning Outcomes

Student's Name	Score	Remarks
NDG	90	Complete
DAS	87	Complete
NKT	80	Complete
FK	80	Complete
MT	82	Complete
KMN	90	Complete
YSPK	89	Complete
ANP	87	Complete
SMM	89	Complete
IPAN	88	Complete
LFS	90	Complete
KNP	83	Complete
TOL	82	Complete

To obtain the student's learning outcome data, a Student Learning Outcomes Test Sheet was used in this research (Putri & Rinaningsih, 2021). The student's learning outcomes are deemed complete if they meet the minimum completion criteria set by the school, which is 70. Data on student learning outcomes in terms of knowledge are presented in Table 3.

Based on the data shown above, it can be concluded that the average learning outcome for the knowledge aspect is 85.7, which falls within the complete category. The learning outcomes for the knowledge aspect, obtained from 15 students after participating in the learning process, were categorised as complete because the average learning outcome for the knowledge aspect was greater than 70, specifically 85.66. This was due to the fact that during the learning process, students were participative and paid close attention, enabling them to understand the material being taught and complete the test questions accurately. The students' learning outcomes were declared complete with an average score of 85.7, having met the school's minimum passing score of 70. Based on the scores obtained from 15 students, a percentage of 85.7% was obtained, which falls into the high category. The learning outcomes of students who utilise learning media integrated with the AIR model not only make them actively involved in the learning process, but also help them avoid being distracted by individual activities or frolicking. In an atmosphere filled with light-heartedness and enthusiasm, students enjoyed the learning process, which was infused with playful elements. Student engagement in learning the material, which is typically taught through lectures and exercises, became more dynamic with the introduction of a play-based approach. All students in the class showed enthusiasm in designing questions and answering them by finding solutions to each challenge presented (Amelia, 2017). The integration of learning and games brought a positive impact on the classroom atmosphere, making the students happier, more motivated, and enthusiastic about participating in each lesson. Findings that were in line with research conducted by Kurnia et al. (2019) which showed that the use of media can increase student motivation to learn. In this context, a fun and dynamic learning atmosphere is created, while still maintaining focus on learning objectives. Based on the research results related to student responses to learning media using the Auditory Intellectually Repetitive (AIR) model, it can be concluded that this approach has a positive and significant impact on the learning process. The utilization of the AIR Model significantly enhances students' conceptual understanding. Intellectually repeating the concepts enables students to listen to explanations of concepts multiple times, contributing to a deeper understanding. Students' learning outcomes

are achieved based on the minimum competency standards set by the school. Likewise, Pritchard (2017) developed contextual chemistry practicum modules employing the ADDIE instructional design framework. Their study demonstrated that multimedia-based practicum materials substantially strengthened students' self-directed learning skills, scientific thinking, and laboratory performance. These results underscore the critical role of well-organized instructional media in facilitating effective and meaningful chemistry learning. In a related study, Rezeki et al. (2023) produced practicum-based chemistry learning videos centered on acid–base topics and grounded in green chemistry principles. Their findings indicated that the instructional videos significantly enhanced students' conceptual comprehension, experimental preparedness, and active participation in laboratory sessions (Clark, 1983). The authors concluded that video-based learning resources serve as an effective medium for connecting theoretical concepts with hands-on practice, particularly in educational contexts with limited laboratory resources. Moreover, Petersen et al. (2020) investigated the implementation of augmented reality-assisted practicum learning videos and found that immersive visual media markedly improved students' readiness, familiarity with laboratory procedures, and conceptual understanding. The study further emphasized that multimedia-rich learning environments can minimize cognitive challenges and boost learners' motivation (Meyer et al., 2019), especially in chemistry experiments involving intricate processes.

Conclusion

This study produced the following conclusions: the results or outputs of this study, which involved practical-based learning video media integrated with the Auditory Intellectual Repetition model, were validated by four validators. After validation, the developed media was declared valid for implementation. The learning outcomes of students were categorized as good. The learning outcomes of students are described as follows. For learning outcomes in terms of knowledge, the average score was 85.7; thus, these learning outcomes, which were then developed and integrated with the AIR-based learning model, successfully increased student engagement during the learning process. Through auditory approaches and intellectual repetition, students are actively engaged in every stage of the learning process. The utilization of the AIR Model significantly enhances students' conceptual understanding. Intellectually repeating the concepts enables students to listen to explanations of concepts multiple times, contributing to a deeper understanding.

Students' learning outcomes are achieved based on the minimum competency standards set by the school. The findings of this study indicate that combining the Auditory, Intellectually, Repetition (AIR) instructional model with the development of chemistry practicum-based learning videos effectively enhances students' academic achievement. The instructional media produced in this research exhibited strong validity, confirming its suitability for use in classroom learning. Moreover, the integration of multimedia-supported practicum activities within the AIR framework effectively fostered active participation, deep cognitive involvement, and systematic reinforcement of concepts, thereby facilitating meaningful.

Conflicts of Interest
The authors hereby declare no conflicts of interest.

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