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Development of a Quizizz-Based Assessment Project-Based Learning Model to Enhance Elementary School Students' Adversity Quotient

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ABSTRACT

Developing students' *Adversity Quotient* (AQ)—the ability to persevere through challenges—is crucial for 21st-century learning. Yet, few studies explore how digital assessment tools like *Quizizz* can be integrated within *Project-Based Learning* (PjBL) to enhance AQ, particularly in elementary education. This study employed a Research and Development (R&D) approach using the ADDIE model (Analysis, Design, Development, Implementation, Evaluation). A Quizizz-based assessment-integrated PjBL model was designed and validated by material, media, and language experts. Data were collected through tests, observations, questionnaires, and expert validation sheets. Quantitative data were analyzed using descriptive statistics, paired-sample t-tests, and N-Gain scores, while qualitative data were analyzed via content analysis. The model demonstrated high validity across all expert evaluations. Students reported strong positive responses in terms of practicality, engagement, and user-friendliness (mean score: 91.01%). The model was effective in improving AQ, as shown by a significant increase in post-test scores (M = 109.81) compared to pre-test scores (M = 86.25; $p < 0.001$) with an average N-Gain of 0.57 (medium category). Notably, the proportion of students categorized as *Climbers* increased from 12.5% to 93.75%. The integration of Quizizz into a structured PjBL model fosters both cognitive understanding and non-cognitive resilience. This model proves effective in cultivating AQ by leveraging gamified assessment features that support persistence, motivation, and reflective learning. Future applications should consider digital readiness and contextual adaptation to maximize impact.

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1. INTRODUCTION

21st-century skills include communication, collaboration, critical thinking and problem-solving, and creativity and innovation. These are skills that students must possess (Elitasari, 2022; Widodo & Kadarwati, 2013). Learning success is not only measured by the achievement of high grades obtained

by students, but learning is said to be successful if students possess other abilities or skills such as the ability to work together with other students and the ability to solve problems (Rindayati, 2022). However, this contrasts with the reality in the field, where the implementation of learning and lack of motivation and challenging learning experiences for students (Fahruddin, Zuriani, Yanto,2025). As a result, many students are satisfied with the results achieved, both in terms of learning experiences and grades. This condition indicates that students have an Adversity Quotient that needs to be developed.

Adversity Quotient (ADQ) is a person's ability to deal constructively with difficulties, failures, and pressures. Students with a high ADQ tend to be more resilient, persistent, and optimistic in facing challenges. Therefore, it is important to develop learning models that focus not only on mastering material but also on developing students' character, including their ADQ. Furthermore, learning challenges often require students to have an ADQ, namely the ability to face, overcome, and adapt to difficulties.

Various studies have demonstrated the influence of Adversity Quotient in improving learning outcomes. However, little research has explored students' Adversity Quotient, a factor that needs to be considered. This is done so that learning plans created by teachers do not always take into account variables such as intelligence and initial abilities, but also the Adversity Quotient factor. Research on Adversity Quotient is increasingly being conducted to increase insight and contribute to knowledge of psychological factors in learning. The gap that occurs, especially in elementary schools, is that some students feel that school is a very boring, scary place, only to waste time, and trouble themselves. This is because some students feel low in confidence and are afraid of failure (Darmadi, 2015; Putra et al., 2016). While prior studies have examined Quizizz and PjBL separately, few have explored their integration in enhancing AQ, particularly among elementary school students.

Research on measuring the Adversity Quotient of high school students found that 73.3% were at the camper level, and 26.7% at the quiter level (Malikah, 2022). These measurement results indicate that students' Adversity Quotient abilities are still predominantly at the champion or moderate level. Many students still give up easily before the exam begins because they always get low test scores, students feel school is a very boring place, students give up in learning if there are difficult lessons, and students are very easily hurt and lack confidence when given negative comments by teachers (Agustina & Suniasih, 2021). In line with the Adversity Quotient profile at SDN Ciganjur 01 South Jakarta, based on an initial survey, it shows that 11% of students are at the climber level, 24% are campers, and the majority are at the quiter level, namely 65%. The majority of students (65%) need to be given treatment to improve their ability to face challenges. Adversity Quotient abilities need to be developed in students through the application of learning models.

One relevant learning approach is Project-Based Learning (PjBL), which provides students with opportunities to learn through hands-on experience by completing real-world problem-based projects. PjBL helps students not only master content but also enhance their critical thinking, communication, and collaboration skills. The Project-Based Learning (PjBL) model has a significant positive effect on improving elementary school students' communication and collaboration skills (Maulidah, 2024). Project-Based Learning (PjBL), as a learning model that emphasizes authentic problem-solving processes, is also increasingly popular. PjBL is considered effective in enhancing students' critical thinking, creativity, and collaboration skills. However, the success of PjBL implementation depends heavily on engaging and relevant project designs and the existence of appropriate assessment mechanisms. Previous research has shown that PjBL implementation can improve students' Adversity Quotient (Mardiana & Amalia, 2022). The results of experimental research show that there is a significant influence of the PjBL model on the Adversity Quotient of elementary school students (Pradnyani & Wibawa, 2023).

The rapid development of information and communication technology has brought significant changes to the world of education. One innovation that has been widely utilized in the learning process is the use of technology-based applications, such as Quizizz. This application offers an interactive and fun way to measure students' understanding of a subject matter. To support the implementation of

Project-Based Learning (PjBL), digital-based technologies such as the Quizizz application offer solutions for interactive and fun assessments. Quizizz, with its gamification features, can increase student engagement in learning and provide instant feedback that helps students understand the material better. The use of Quizizz in assessment is also relevant to the needs of modern, technology-based learning. Previous research has shown that the Project-Based Learning (PjBL) model using Quizizz learning media has an impact on improving learning outcomes (Putra et al., 2024).

Various research results on the use of Quizizz in school learning as a learning and assessment medium. There is an effect of using the Quizizz application on the science learning outcomes of fourth-grade elementary school students (Annisa & Erwin, 2021). The Quizizz evaluation media can increase student learning motivation (Rohman & Lestari, 2022). The use of Quizizz can increase the competitive spirit of elementary school students in learning (Ianah & Prayitno, 2023). Innovative learning media such as Quizizz, by combining game elements and interactive features, stimulates student engagement and interest in learning, provides an interesting and effective learning experience, and has a positive impact on student attitudes towards learning (Mesterjon et al., 2024). Quizizz increases student engagement and motivation, encourages collaborative learning, and promotes inquiry-based learning, and is effective in improving student academic performance and understanding of scientific concepts (Nurfadila et al., 2024).

The Project Based Learning (PjBL) model equipped with Quizizz-based assessment has the potential to be an innovative solution to improve students' Adversity Quotient through collaborative and challenging learning. Therefore, this study developed a Project Based Learning (PjBL) model based on assessment using the 6 Quizizz applications, specifically on the topic of energy sources around us. With this approach, it is hoped that students will not only understand the learning material but also be able to improve their Adversity Quotient so that they become more resilient, creative, and adaptive individuals in facing various challenges.

This study focuses on analyzing the validity, practicality, and effectiveness of the Project Based Learning (PjBL) model based on assessment with the Quizizz application to increase Adversity Quotient. Therefore, the main research question is: how valid is the developed Quizizz-based PjBL assessment model and how practical is the model when implemented in science classrooms besides that to what extent is the model effective in improving students' AQ?

2. METHOD

This study used Design and Development Research (DDR) with the four stages involved; define, design, development, and evaluation (Sugiyono, (2017). The reason for using DDR is when the problems faced by teachers, students, or educational institutions require solutions in the form of applicable products. The context of this research is to develop and validate the assessment-based Project Based Learning (PjBL) model with the Quizizz application to increase the Adversity Quotient.

Stage One: Define, This initial phase involves a thorough analysis of student needs and required competencies. Key activities include directly observing students in their learning environment to identify their specific needs, and observing science teachers to understand their current teaching methodologies. The information gathered from these observations is then analyzed to identify and conclude the challenges faced by both students and teachers during the learning process. This stage also includes a comprehensive review of relevant literature. Stage Two: Design, In the design phase, the focus is on creating a prototype for an assessment-based Project Based Learning (PjBL) model with the Quizizz application. This involves determining the components of an assessment-based Project Based Learning (PjBL) with the Quizizz application. This stage also includes selecting appropriate teaching materials, designing guidelines for implementing the Project Based Learning (PjBL) based on assessment with the Quizizz application, and developing evaluation tools to assess the learning media's effectiveness. Stage Three: Develop, The development stage involves gathering and compiling necessary references for media creation, and preparing evaluation instruments. Small group trials are

conducted to assess the product's suitability for use in the learning process, specifically to determine the validity of its content and indicators, and to analyze research instruments. After these trials, experts evaluate the developed product to ensure its practicality. Further small group trials were then conducted to reassess the product's viability after incorporating feedback from the expert review. Any findings from these trials lead to further revisions. Stage Four: Evaluate, The final stage, evaluation, involves a comprehensive assessment of the developed product's outcomes. Evaluation of aspects of implementing the Project Based Learning (PjBL) model, and aspects of assessment with Quizizz, as well as students' Adversity Quotient achievements so that development can produce viable products.

In this study, qualitative data was the primary focus for data collection. This data was collected from two experts, namely material experts and media experts, who provided feedback on the material, learning, and display aspects of the product (Miles, Huberman & Saldana, 2014). Purposive sampling was chosen because researchers needed respondents or subjects who had certain characteristics that were directly relevant to the focus of the research. To collect this data, various instruments were employed. These included test instruments, observation sheets (questionnaires), practicality assessment sheets from learning experts, and material assessment sheets from material experts. The primary purpose of the product practicality assessment sheet was to gather information regarding the practicality of the learning media. The research and development involved two main subject groups: Validators: This group included both learning media experts and material experts who assessed the product. Trial Subjects: This group consisted of fourth-grade elementary school students who participated in the trials.

Table 1. The grid of the questionnaire for assessing teaching materials by material experts

Dimension	Indicator	Item
Material Quality	Coherence of material	1
	Breadth of content coverage Content	2
	Alignment with core competencies (skl) and learning outcomes	3
	Material accuracy	4
	Content	5
Language Quality	Clarity of language	6
	Language rules	7
	Suitability to target audience	8
	Consistency of terminology	9
Quality of Supporting	Systematic Writing	10
	Presentation	11
	Appropriateness of Exercises to Learning Outcomes	
	Balance of Exercises/Tests with Material	12
	Language of Instruction	13
	Summary	14

Table 2. Quizizz Media Assessment Questionnaire Instrument Grid by Media Experts

Dimension	Indicator	item
Cognitive elements	Urgency, relevance, and usability of media/technology	1
	Suitability to learning objectives	2
	Material completeness	3
	Illustrations support learning materials	4
	Material delivery is clear and communicative, and adheres to language rules	5
Media/Technology Integrity	Facilitates familiarity with digital assessment media	6
	Supports independent and reflective learning	7
	Questions train resilience	8
	Scoring and ranking features	9
	Visualization appropriateness	10
Overall Function:	Affordability of educational institutions	11
	Can be implemented at the elementary school level	12
	Relevant for training students' Adversity Quotient	13
	Matching practice/test questions to competencies	14

Source: Irdalisa (2019), Branch & Dousay (2015)

Table 3. Language Expert Assessment Questionnaire Instrument Grid

Dimension	Indicator	Item
Straightforwardness	Accuracy of Sentence Structure	1
	Sentence Effectiveness	2
	Standardization of Terms	3
Communicative:	Understanding the message or information	4
	Contextual appropriateness	5
	Use of illustrations, examples, or analogies	6
Dialogic and Interactive	Motivates Students	7
	Encourages Reflective Activities	8
	Sparks or Invites Thinking	9
	Supports Learning Outcomes	10
Appropriateness to Student	Intellectual	11
	Emotional	12
	Learning Style	13
Conformity to Grammar	Rules	14
	Spelling	15

Source: Branch & Dousay (2015)

Table 4. Grid of Student Response Questionnaire Instrument

Dimension	Indicator	Item
Facilitating student learning	Learning tools help students understand concepts	1
	Images, colors, and examples support clarity of material.	2
	Illustrations. Images, colors, and examples motivate learning.	3
	Learning independence	4
Comprehensive	Presentation of material	5
	Illustrations support learning materials	6
	Completeness of materials	7
	Student worksheets support the materials	8
	Assessment with Quizizz is interesting and challenging	9
Adaptive	up-to-date material	10
	Adaptability to character and learning style	11
	Supports information and insight	12
	Encourages curiosity	13
	Trains resilience	14
User Friendly	Alignment with learning objectives	15
	Learning sequence	16
	Clarity and ease of project implementation	17
Use of written language	Communicative and easy-to-understand	18
	Use of spelling	19
	Consistency of terms	20

Sumber: Irdalisa (2019), Branch & Dousay (2015)

Table 5. Student Adversity Quotient Instrument Grid

No.	Dimension	Indicator	ItemNumber		Total
			Positive	Negative	
1.	*Control* (C)	1. Managing challenges and obstacles, and never giving up	1.7	3	3
		2. Managing challenges and obstacles, and never giving up	13.19	15	3
		3. Taking the initiative to complete projects	25.31	27	3
2.	*Origin* (*O*)	1. Identify the causes of difficulties or failures	2.8	6	3
		2. Take initiative and responsibility	14.20	18	3
		3. Take active action to improve the situation	26.32	30	3
3.	*Reach (R)*	1. Ability to separate project issues from other aspects of learning	4.10	9	3
		2. Respond to failure in a single task	16.22	21	3
		3. Maintain enthusiasm and motivation for learning	28.34	33	3

4.	*Endurance* (E)	1. Perception of hope that difficulties in a project are temporary	5.11	12	3
		2. Optimistic response to difficulties	17.23	24	3
		3. Ability to persist in the face of obstacles	29.35	36	3
Total			24	12	36

Source: Grant, B.-J. (2019),

The level of effectiveness of the application of the learning model refers to Hake's (1998) categories.

Table 6. Effectiveness Level Category

N-Gain	Category
G > 0,7	High
0,3 ≤ G ≤ 0,7	Medium
G < 0,3	Low

Adversity Quotient levels based on Pre test and Post test scores are ranked based on the following categories:

Table 7. Adversity Quotient Level Score Interval

Level AQ	Interval
Climber	x > 96
Camper	64 ≤ x < 96
Quitter	x < 64

(Wardani et al., 2019)

The assessment in the feasibility validation questionnaire for the Project Based Learning (PjBL) model based on assessment with the Quizizz application uses a Likert scale as follows:

Table 7. Expert Validation Scale

Category	Interval Score
Very Valid	76 – 100
Valid	51 – 75
Quite Valid	26 – 50
No Valid	0 – 25

The assessment in the Adversity Quotient measurement questionnaire uses a modified Likert scale as follows:

Tabel 8. Practicality Assessment Scale by Students

Category	Score Range
Very Good	76 – 100
Good	51 – 75
Fairly Good	26 – 50
Poor	0 – 25

This study was analyzed through qualitative descriptive analysis. The qualitative descriptive analysis technique was carried out based on the results of the validation of material and media experts. Validation of this instrument was carried out to meet content validity and empirical validity. Quantitative analysis was performed using a paired sample t-test if the assumption of normality is met.. T-test analysis is a procedure used to compare two groups of related data. In this case, it was used to analyze the results of the pretest and posttest in the same subject.

3. FINDINGS AND DISCUSSION

This research is in line with Fida Mega Nur Hidayati's research which only researched through the stages of analysis, design , development, , implementation and evaluasi. (Hidayati et al., 2022).

3.1 Analysis Stage

Problem and needs analysis: Students tend to give up easily when faced with difficulties, lack self-confidence, and quickly lose motivation if not given clear support. They enjoy interactive, technology-based learning, but are not yet accustomed to managing stress in learning. Learning is still predominantly lecture-based and has not been effective in developing students' fighting spirit. Teachers recognize the potential of media such as Quizizz to increase motivation and engagement, but their use has not been optimal, especially in fostering a never-give-up attitude, self-confidence, and problem-solving skills. Science material has the potential for project-based contextual learning. Achievements that target not only mastery of Science material but also the development of Adversity Quotient are needed.

3.2 Design Stage

At the design stage, researchers developed a Project Based Learning (PjBL) based learning product with the support of the Quizizz application. Teaching Module, Quizizz-based assessment media integrated with Adversity Quotient development indicators. The Project Based Learning (PjBL) learning design based on assessment with Quizizz includes several components, namely: (1) Teaching Module, (2) Teaching Material, (3) Quizizz, with the following characteristics: This teaching module is designed based on Project Based Learning (PjBL) which combines in-depth and meaningful learning, so that students not only understand the theory but are also able to apply it in real contexts.

Figure 1. Science Teaching Module Design

The science teaching materials on the topic of Energy Sources Around Us have contextual characteristics and are close to everyday life, especially the theme of energy around us, making it easier for students to relate the material to real experiences.

Figure 2. Design of Science Teaching Materials on the topic of energy sources around us

Quizizz's assessment media is designed to maximize its features: (a) survey mode, (b) mastery peak, and (c) leaderboard. Survey mode in Quizizz explores students' opinions and attitudes without judging them as right or wrong. In Project-Based Learning (PjBL), this mode helps students see how they respond to challenges while working on projects.

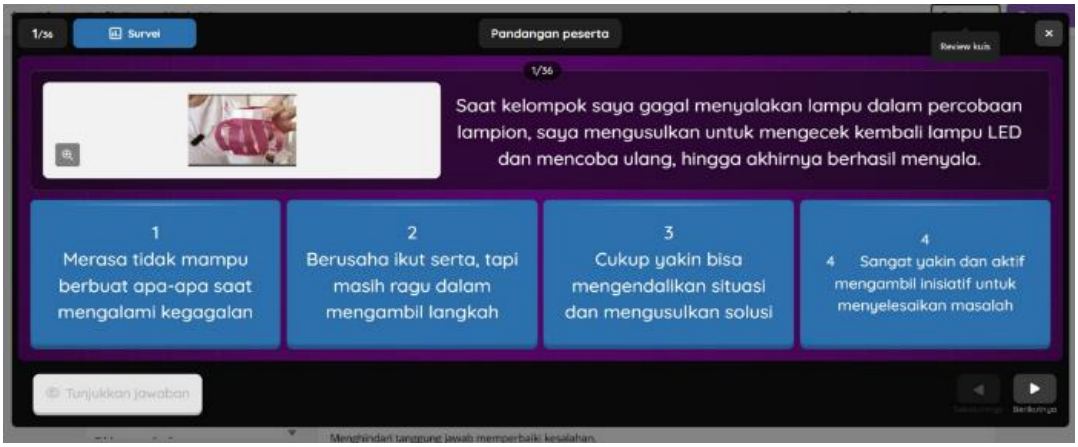

Figure 3. Adversity Quotient survey mode design in Quizizz

The Leaderboard feature in Quizizz serves as a form of appreciation and motivation for students. By displaying rankings, students are encouraged to compete fairly, take responsibility for their learning outcomes, and persevere. In the context of Adversity Quotient, the leaderboard helps foster a spirit of challenge and encourages students to continuously improve.

Figure 4 . Quizizz Media Assessment Leaderboard Feature

This Adversity Quotient instrument was developed specifically for fourth-grade elementary school students in project-based science learning. It measures four main aspects of the Adversity Quotient: control, origin, reach, and endurance. It uses simple sentences and real-life situations close to students' experiences, such as difficulties in experiments or project assignments. Its strengths lie in its contextual questions, age-appropriate language, and ease of assessment.

3.3 Development Stage

The development stage aims to produce a product after revisions based on input from experts or practitioners and the results of trials. The development stage involves expert validation by subject matter experts, Quizizz media experts, and linguists to ensure product quality.

Table 9. Comments and Suggestions for Improvement in the Development Stage

Aspect	Validator	Component	Comments/Suggestions
Material	Dr. Tri Isti Hartini, M.Pd	Teaching Module	Selecting appropriate operational verbs (OJVs) in the teaching module and correcting typos.
		Teaching Materials	Selecting appropriate verbs and checking for typos.
		Evaluation Instruments	Formative evaluation instruments are generally aligned with learning outcomes.
Media	Prof. Dr. Samsul Maarif, M.Pd	Media Quizizz	(1) The selection of Quizizz media must theoretically accommodate the Adversity Quotient aspect; (2) Provide feedback on each question item because it becomes the treatment for each item; (3) The form of the questions is adjusted to the indicators; (4) The module is attempted to be supplemented with context to understand the Adversity Quotient.
Language	Dr. Yulian Dinihari, M.Pd	language	Improvements to sentence structure and scientific notation.

The expert assessment results revealed several areas for improvement. Regarding the material aspect, it is necessary to choose appropriate operational verbs and correct typos in the teaching modules and materials, as well as refine the language to make it more communicative. Regarding the media aspect, the use of Quizizz must be based on theories that support the development of Adversity Quotient, with feedback provided on each question, questions aligned with indicators, and contextualization to support understanding of Adversity Quotient.

Table 10. Development Results Before and After Revision

No.	Output	Expert Suggestion and Input	After Revision
1.	Teaching Module	Based on expert input, the selection in the previous teaching module was inappropriate and contained typos, which affected the clarity of the learning objectives. After validation, the KKO was revised and the writing improved, making the module clearer and easier to understand.	in the teaching module has been revised to comply with applicable standards, and previously found typos have also been corrected, so that the module content is clearer and easier to understand.
2.	Teaching materials	Before the revision, the verb tenses in the teaching materials were inappropriate and contained several typos. After the revision, the verb tenses are more appropriate and the typos have been corrected, making the teaching materials clearer and easier to understand.	The choice of verbs in the teaching materials has now been adjusted to be more precise, and previous typos have been corrected, so that the material is clearer and neater.
3.	Quizizz assessment media	Expert feedback indicates that the design of Quizizz's assessment media does not fully accommodate the Adversity Quotient aspect. The items lack feedback, and the question format does not align with the established indicators.	After being refined, the Quizizz assessment tool has been designed to measure Adversity Quotient. Each question is accompanied by feedback to help students understand the answer.
4.	Test and non-test instruments	Formative test instrument for the topic of energy sources around us: Questions are designed contextually, with age-appropriate language and illustrations, to assess critical thinking skills and application in everyday life. In the non-test Adversity Quotient instrument, there are still sentences that are not clear and confusing for students.	The formative test questions on energy sources around us are designed contextually, according to student development, and support critical understanding and everyday application. Meanwhile, the non-test instrument, the Adversity Quotient for 4th grade, is simplified and easier for teachers to analyze.

The revisions by material and language experts are technical in nature and do not concern aspects of presentation, appearance, or layout, while significant changes are the result of media expert revisions to the Quizizz assessment media. The validity of the model is assessed based on the results of expert judgment which includes the validity of material, media, and language experts, as well as the relationship between the components of the learning model and the learning objectives. The following are the results of the validation of learning devices from material experts. The components of the learning model assessed by experts include: (a) Learning Objective Flow, (b) Learning Implementation Plan/Teaching Module, (c) Teaching Material, (d) Quizizz Assessment Media, and (f) language.

Table 11. Results of Validation by Material Experts and Teaching Modules

No.	Assessment Components	Score	%
1.	Teaching Module Components	3.00	75.00
2.	Assessment Components	3.71	92.86
3.	Learning Resources	4.00	100.0
4.	Matching the Characteristics of PjBL and Quizizz	3.50	87.50
Mean		3.61	90.24
Conclution		Very Valid	

The general validation results of the devices assessed were in the very good category, with an average score of 3.61.

Table 12. Expert Validation Results for Teaching Materials

No.	Assessment Components	Score	%
1.	Material Quality	3.71	92.9
2.	Language Quality	3.50	87.5
3.	Presentation Support Quality	3.60	90.0
Mean		3.60	90.12
Conclution		Very Valid	

The validation results showed that the material quality scored 3.71, indicating that the material was considered very good and met standards. The language quality scored 3.50, which is considered good but still has room for improvement to be clearer and more communicative..

Table 13. Media Expert Validation Results for Quizizz Assessment Media

No.	Assessment Components	Score	%
1.	Cognitive Elements	3.60	90.0
2.	Media/Technology Integrity	3.55	88.6
3.	Overall Function	3.67	91.67
Mean		3.60	90.10
Conclution		Very Valid	

The results of the validation of the Quizizz assessment media show that the overall function received the highest score of 3.67, which indicates that in general this media is considered very good and in accordance with the purpose of its use in learning.

Table 14. Linguist Expert Validation Results

No.	Assessment Components	Score	%
1.	Straightforward	3.67	91.7
2.	Communicative	3.67	91.7
3.	Dialogic and Interactive	3.75	93.8
4.	Appropriate to Student Development	2.67	66.7
Mean		3.40	83.75
Conclution		Very Valid	

Validation results showed that the dialogic and interactive aspects received the highest score of 3.75, followed by straightforward and communicative, which each received a score of 3.67. This

indicates that the language in the material is clear enough, easy to understand, and able to build interaction with the reader.

3.4 Implementation Stage

In the implementation phase, the Project-Based Learning (PjBL) model was applied to the science lessons on Energy Sources Around Us for fourth-grade students at SDN Ciganjur 01. The learning was supported by teaching modules and the interactive media Quizizz.

The assessment-based Project-Based Learning (PjBL) model, using the Quizizz application, was implemented in the fourth-grade science lessons for the Energy Sources Around Us topic. The following are the results of a questionnaire survey of students' responses to the assessment-based Project-Based Learning (PjBL) model using the Quizizz application for the Energy Sources Around Us topic.

Table 15. Student Response Results for the Practicality of the Learning Model

No.	Validation Aspect	Mean	Percentage (%)	Criteria
1.	Facilitating student learning	3.65	91.2	Very Valid
2.	Comprehensive	3.65	91.3	Very Valid
3.	Adaptive	3.61	90.3	Very Valid
4.	User-Friendly	3.59	89.8	Very Valid
5.	Use of Written Language	3.70	92.4	Very Valid
Mean		3.64	91.01	Very Valid

The questionnaire results showed that the practicality of implementing the Quizizz-based Project-Based Learning (PjBL) model was highly assessed by students. All measured aspects were categorized as Very Valid, with an overall average score of 3.64. This model is considered capable of facilitating student learning effectively.

The effectiveness of the model was tested using a Paired Sample Test, where the model was applied to the same group with different test treatments at different times: a pre-test before the learning model was implemented, and a post-test after the learning model was implemented. The results are as follows:

Table 15. Mean and Standard Deviation Pre Test and Post Test

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	PostTest	109.81	32	10.787	1.907
	PreTest	86.25	32	9.625	1.702

The average post-test score (109.81) was higher than the pre-test score (86.25) for 32 students. The distribution of scores was quite stable, with a standard deviation of 10.787 for the post-test and 9.625 for the pre-test. This indicates an increase in ability after learning.

Table 16. Result of *Paired Samples Test*

		Paired Differences 95% Confidence Interval of the Difference Upper	t	df	Sig. (2-tailed)
Pair 1	PostTest - PreTest	27.303	12.849	31	.000

Based on the above data, it can be concluded that the application of the PjBL learning model based on assessment with Quizizz in the science learning of grade IV elementary school students effectively increases the Adversity Quotient. The results show an N-Gain score with an average of 0.57. The effectiveness of the application of the PjBL learning model based on assessment with Quizizz in science learning in increasing the Adversity Quotient of grade IV elementary school students is in the moderate category. The level of Adversity Quotient of Students before and after the application of the Problem Based Learning (PjBL) learning model based on assessment with the Quizizz application is as follows:

Table 17. Level of *Adversity Quotient*

Level	PreTest (%)	PostTest (%)
Climber	12.5	93.75
Camper	84.4	6.3
Quitter	3.1	0.0

The data shows a significant shift in students' Adversity Quotient levels after the learning process. Before the learning process, the majority of students were at the Camper level (84.4%), while only 12.5% were Climbers and 3.1% were Quitters. After the learning process, the Climber level jumped to 93.75%, while Campers dropped drastically to 6.3% and Quitters to 0%. This indicates an increase in students' overall fighting spirit.

3.5 Evaluate

The evaluation of the development of the Project-Based Learning model based on assessment with Quizizz began with the Analysis stage, which demonstrated the need for learning innovation to improve students' Adversity Quotient. In the Design stage, teaching modules, teaching materials, Student Worksheets (LKPD), and Quizizz assessment media were developed to support project-based learning. The Develop stage resulted in expert-validated learning tools that were declared suitable for use. When implemented, the teaching modules were deemed practical and supportive of learning, and the teaching materials were engaging and effectively guided student work. Quizizz was used not only for interactive material assessment but also for conducting AQ pre-tests and post-tests, which showed an increase in student resilience after learning. This model proved feasible and effective in improving both material understanding and students' Adversity Quotient. Based on the significance value, it is 0.001 <0.05. This can be concluded that there is a significant difference between the pretest (before treatment) and the posttest (after treatment). This shows that there is a significant influence on the differences in treatment given to each variable.

Discussion

In the Analysis phase, it was found that students give up easily and lack confidence despite being interested in interactive technology, while teachers have not optimally utilized Quizizz to train their fighting spirit and problem-solving. The science and natural sciences material is suitable for contextual projects, but the learning is still predominantly theoretical, so learning outcomes that also develop

Adversity Quotient are needed. Entering the Design phase, a Quizizz-based PjBL model was designed that not only measures cognitive aspects but also trains Adversity Quotient through interactive features such as surveys, quick feedback, mastery peaks, and leaderboards. The teaching material is filled with real-life projects, namely the construction of a simple electric windmill, which combines science and natural sciences concepts with problem-solving and resilience skills. In the Development phase, expert validation showed the model to be highly valid although it was recommended to improve the language to be more communicative and to compile the KKO more appropriately. In addition, Quizizz needs to be equipped with feedback on each question to truly train Adversity Quotient. During implementation, the windmill project successfully triggered students' creativity and fighting spirit, while Quizizz was effective not only as a test, but also as a reflection tool to measure students' responses in facing difficulties.

The evaluation phase showed significant results, with an increase in pre-test and post-test Adversity Quotient scores. The percentage of students in the Climber category skyrocketed, while the Quitter level dropped to zero. The t-test results were significant and the N-Gain showed the model was effective in increasing Adversity Quotient. The Quizizz-based PjBL model was effective in increasing students' Adversity Quotient. The electric windmill project trained creativity and resilience, while Quizizz supported interactive evaluation. The results showed a significant increase in Adversity Quotient, with more students becoming Climbers and no more Quitters. The Quizizz-based PjBL model was effective in increasing students' Adversity Quotient. The project trained creativity and resilience, while the interactive features of Quizizz were able to increase the number of Climbers, and Quitters dropped to zero. The integration of PjBL with the ADDIE model not only helps in designing structured and contextual learning but also non-cognitive aspects such as Adversity Quotient.

The graphical results show that all dimensions of Adversity Quotient (AQ) increased after implementing Quizizz-based Project-Based Learning (PjBL), with the Reach dimension being the most dominant (from 20.7 to 27.6). This indicates that students are increasingly able to limit the impact of learning difficulties. This improvement is influenced by Quizizz's rapid feedback, leaderboard, and mastery peak features, which encourage reflection, persistence, and a spirit of self-improvement. Quizizz not only assesses but also trains students' resilience in facing learning challenges.

Previous research focused on the design and construction of Project-Based Learning (PjBL)-based learning media using the ADDIE model. This research demonstrated the development of an interactive platform that supports teacher-student interaction and collaboration in projects, as well as strengthening students' critical thinking skills (Wibawa & Susanti, 2024). The implementation of ADDIE-based PjBL in IoT learning significantly improved students' creative thinking skills, with posttest scores increasing and gains in the moderate category (Wahyudin et al., 2022).

The assessment results indicate that the teaching module generally met high validity criteria. The majority of components received maximum scores, indicating that the module's identity, time allocation, alignment of learning objectives with learning outcomes, and integration of the Project-Based Learning (PjBL) approach and the use of digital media such as Quizizz were well-designed. This aligns with the views of Martin & Bolliger (2022), who emphasized the importance of structured, activity-based teaching modules that utilize digital technology to enhance student engagement and learning outcomes.

PjBL requires students to face open-ended problems, work in teams, and develop innovative solutions. This situation enhances students' resilience and adaptability to stress, especially when facing obstacles or failures in projects (Sumarni et al., 2021; Puspitasari & Al Ayubi, 2023). The use of applications like Quizizz supports interactive formative assessment, helping teachers monitor the achievement of learning objectives in real time (Wang & Tahir, 2020). However, there are still several aspects that need to be improved, especially in the components of compiling operational verbs, the adequacy of RPP elements to support learning objectives, and the design of activities that more explicitly train students' independent thinking.

The teaching materials demonstrate good quality and are valid for use in learning. High scores on the material aspect indicate that the content is accurate, coherent, and aligned with learning outcomes (Martin & Bolliger, 2022). Language use is generally clear and on-target, supporting student understanding (Anderson & Krathwohl, 2021). However, several indicators, such as the breadth and depth of the material, the accuracy of language rules, the consistency of terminology, and the balance between exercises and material, still need improvement to make the material more comprehensive and understandable. This module already meets validity criteria, but improvements in these aspects will further strengthen the quality of the teaching materials, especially in supporting 21st-century learning, which demands clarity, relevance, and the connection of material to student needs (Wang & Tahir, 2020).

The validation results of the Quizizz assessment media are suitable for use in science and science learning, and are categorized as valid. The advantages of this media lie in its ability to present relevant, interactive material, and support independent and reflective learning, which are crucial in today's technology-based learning (Martin & Bolliger, 2022). Features such as scores, rankings, and positive feedback have been proven effective in increasing student learning motivation (Wang & Tahir, 2020). However, visualization aspects such as the use of graphics, animation, and proportionality of the display remain weaknesses that need to be improved to make the media more engaging and support conceptual understanding (Mayer, 2021). Furthermore, the use of more communicative and consistent language is also important to ensure that the material is easily understood by students (Anderson & Krathwohl, 2021).

This is crucial because material that is not aligned with students' emotional states can hinder understanding and interest in learning (Trilling & Fadel, 2021). Furthermore, standardization of terms, use of illustrations, grammatical accuracy, and spelling still need to be refined so that the material is more in line with language standards (Anderson & Krathwohl, 2021). The validity of the material is further enhanced, making it more effective for use in communicative, interactive, and developmentally appropriate learning (Wang & Tahir, 2020).

The questionnaire results showed that the implementation of the Quizizz-based PjBL model on the topic of energy sources around us was highly rated by students. High scores for aspects of ease of learning, media illustrations, and the material's suitability to technological developments confirm that this model is effective in increasing student engagement and understanding (Martin & Bolliger, 2022; Wang & Tahir, 2020). Furthermore, the Quizizz application's ease of use and communicative language also support interactive and adaptive learning, which is important in building students' Adversity Quotient, namely the ability to survive and rise to challenges (Stoltz, 2021).

Project-Based Learning (PjBL) integrated with digital technology is not only effective in improving material understanding, but also increases Adversity Quotient, namely the ability of students to survive, adapt, and recover from difficulties (Stoltz, 2015). This is very important in the context of learning Natural and Social Sciences (IPAS) which is full of conceptual and contextual challenges. The results of this study strengthen the current literature stating that digital learning innovations can support the development of positive character of students. The results of this study are in line with various previous studies that show that the implementation of Project-Based Learning (PjBL) and the use of interactive digital media such as Quizizz can have a positive impact on the development of students' non-cognitive abilities, including Adversity Quotient. The implications for teacher training from PjBL include strengthening pedagogical competencies. Teachers need to be trained to design projects that are relevant to the curriculum, engaging for students, and foster 21st-century skills (critical thinking, collaboration, creativity, and communication). Training should focus on project planning, implementation, and assessment.

4. CONCLUSION

The study concluded that the characteristics of the Project Based Learning (PjBL) Assessment-Based learning model with the Quizizz Application meet valid criteria, and are practical to use in Science learning on the Energy Sources Around Us material, and are effective in increasing the Adversity Quotient of Grade IV Elementary School Students. Through a project-based approach and the use of interactive technology, students are encouraged to be more active, reflective, and responsible in their learning process. The recommendation that It's important to note that this learning product is best suited for schools equipped with the necessary infrastructure. The implications of this study are that the use of digital teaching materials and literacy can support contextual, relevant, and meaningful learning for students. The Project Based Learning (PjBL) Assessment-Based Learning Model with the Quizizz Application is used in grade IV of other schools to support and improve the quality of learning and Adversity Quotient of Students, but still pay attention to the conditions, problems, needs, and characteristics of Students.

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