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Multiple Intelligence-based basketball performance assessment in high school

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ABSTRACT

This study aims to develop performance assessment instruments in the MI (Multiple Intelligences) based basketball game by: (1) proving the validity of the content of the instrument, (2) proving the validity of the instrument construct, (3) conducting a model fit analysis and item fit with IRT (Item Response Theory), and (4) analyzing the effectiveness of the developed instrument product. Methods in developing assessment models using IDDIE (analysis, design, development, implementation, and evaluation). The research subjects used were 1053 students in five schools in five districts in Yogyakarta Province. The development of a scoring model resulted in (1) the validity of the contents of the five raters using the V-Aiken method yielding a value of 0.92; (2) the validity of the performance instrument construct shows 28 aspects of the warning with a loading factor of >0.3; (3) the fit model for this instrument matches the ability of the learner between -4.817 to 2.24; (4) the effectiveness of the product showed a high value, i.e., 38% of users felt "very satisfied," 56% of users felt "satisfied," and 6% of users felt "dissatisfied."

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INTRODUCTION

The Law No. 20 of 2003 concerning the National Education System states that the purpose of national education has the main and main value of developing the potential of students to become human beings who have faith and piety in God, have a noble character, are healthy, knowledgeable, capable, creative, independent, and become democratic and responsible citizens. If it is associated with the subject of physical education in sports and health (*Pendidikan Jasmani, Olahraga, dan Kesehatan* or PJOK), the law expressly explains the word "healthy" has the meaning that in the learning process PJOK must be prioritized physical and psychic activity as an effort to achieve a healthy person. Thus, healthy is the main basis in educating children to become individuals who meet the criteria in the main objectives of national education in Indonesia.

A survey conducted by PISA (Programme for International Student Assessment) measured science, reading and maths skills for learners aged 15. PISA assessments are held once every three years. The 2018 PISA study report ranked Indonesia 70th out of 78 countries for science literacy with a score of 396 and an international average score of 489. Reading literacy ranked 72 out of 78 countries with a score of 371 and an international average score of 487. Mathematical literacy ranked 72nd out of 78 countries with a score of 379 and an average international score of 489. Based on the results of the survey, education in Indonesia is in serious trouble (OECD, 2018).

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Education has an important role in the process of forming a person's physical and mental development. It can increase the potential possessed by a student to face problems that arise. The development of technology exerts a great influence on the physical activity carried out by humans. By optimizing the role of technology, humans become devoid of desires and impulses that change and degrade one's health orientation. For example, when using a health measuring clock that always measures a person's heart rate, if the results are normal, it will affect that exercise is not necessary. These results will in turn lower a person's orientation about the importance of exercising for mental and physical health. In line with the research of Ibnian and Hadban (2013), the results of this study allow the application of MI which can increase learning motivation which is assumed to improve student learning outcomes.

Okudan (2021) concluded that there is a relationship between physical activity and the level of compound intelligence in sports athletes with different teams based on the subdimension of compound intelligence studied. On the other hand, it was found that there is a positive relationship between physical activity and the level of logical and kinesthetic intelligence. Pratama et al. (2020) also examined the relationship between physical body-kinesthetic motion ability (multiple intelligences) and student learning outcomes. From this research, it is shown that compound intelligence can improve student learning outcomes. Thus, the results of the study show a relationship between physical activity, compound intelligence, and learning outcomes. Thus, it can be concluded that kinesthetic intelligence or which is part of physical activity in physical education, sports, and health (PJOK) can activate other intelligences, namely logical intelligence (logic). The results of the study also show that aspects of compound intelligence can be activated through PJOK activities developed with good instruments.

The theory developed by Gardner through his research related to MI states that everyone has eight intelligences. The eight intelligences function together in a way that is unique to each person. MI referred to by Gardner (2011) include, (1) linguistic intelligence which includes a person's ability to master words and language, one's ability to fantasize (imagine), master and learn language; (2) logical-mathematical intelligence, that is, a person's ability to face and assess an object, abstract, understand the relationship of these objects in a certain principle; (3) spatial intelligence, which is the ability to perceive, modify, transform, and create visual experiences with or without stimuli; (4) bodily-kinesthetic intelligence, that is, the ability to control gestures and the skill of managing objects; (5) musical intelligence, which is the ability to change and display musical composition, listen, and understand music; (6) interpersonal intelligence, this intelligence is characterized by the ability to digest and respond appropriately to the moods, temperaments, motivations and desires of others; (7) intrapersonal intelligence, this intelligence is characterized by the ability to understand one's own feelings and the ability to distinguish emotions, have knowledge of the strengths and weaknesses of the self; and (8) naturalist intelligence, that is, the ability to understand the natural environment well, can create other consequential distingencies in the natural realm, the ability to understand and enjoy nature, and use those abilities productively. In 1999, Gardner (2000), again produced an intellectual work entitled Intelligence Reframe which added human compound intelligence to nine intelligences, namely existential-spiritual intelligence.

The PJOK curriculum in class X listed in the 2013 Curriculum provides an overview of two Basic Competencies (*Kompetensi Dasar* or KDs) that are important to optimize. The two KDs are: (1) analyzing and practicing the results of the analysis of the motion skills of one of the big ball games to produce good motion coordination, (2) analyzing and practicing the results of the analysis of brisk walking, running, jumping, and throwing skills to produce effective movements. Therefore, the game of basketball in all schools at the high school level must be practiced and assessed. So far, the game of basketball has only had projections to win a competition, open based on the optimization of the intelligence of the learners themselves. The results of the initial survey were conducted on September 13, 2021, in ten schools in Kulon Progo Regency with a needs analysis instrument, namely ten items of questionnaire

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questions. The results of a survey conducted on 11 teachers in Kulon Progo Regency showed that 64% or seven teachers think that assessments in the field of sports tend to be subjective and difficult to do optimally. On the other hand, at basketball games 73% or eight teachers argue that the acquisition of scores and victories in basketball is more important than the development of student intelligence. Intelligence in students can be activated entirely by the existence of an MI-based basketball game assessment model. The results of an interview with a PJOK teacher at SMAN 1 Temon, Kulon Progo corroborated that it is difficult for teachers to compile or make the MI instrument itself. Therefore, if successfully developed an instrument that can measure compound intelligence, it will be very helpful for PJOK teachers. The results of the interview showed that teachers were still unable to identify and make instruments to assess the abilities of students in a real way based on compound intelligence. For this reason, an instrument is needed that can measure compound intelligence comprehensively in the PJOK activities of students. Relevant to that, Gurcay and Ferah (2017) give an idea that physics materials that use MI also make learning more enjoyable.

In addition to the difficulty of developing MI-based assessments, problems also arise from the low awareness of students in sports, so that sports are seen only as a formality of physical activity. Rahman et al. (2020) showed that the perception of class X students in PJOK learning in the category was not good with a percentage of 60%. This shows that there is still a lack of awareness of students in PJOK learning. Murat (2015) shows that there is a significant positive relationship between interpersonal intelligence and sports experience. Thus, MI assessment needs to be integrated into the game of basketball so that in addition to improving the kinesthetic intelligence aspect, it can also optimize the other eight intelligences.

The game of basketball is a sport that maximizes all physical strength and cognition together. Siskandar (2012) shows that various activities relevant to the development of MI are useful in developing the learning competencies of these students. Meanwhile, Abdulmohsen (2018) looked for the influence of strategies for the use of multiple intelligence theory on the development of basketball ability. The need for an instrument device developed through MI became the basis for the development of this product. The results are significant with relevant research and preliminary surveys in ten schools in Kulon Progo Regency to strengthen basketball game activities. The development of compound intelligence-based assessment instruments will improve the ability to play basketball comprehensively, especially in optimizing the intelligence of students. This is strengthened by the result of a research showing that MI-based learning can improve conceptual mastery. Besides, students' interest in the learning process can also improve so it brings optimum effects (Pratiwi et al., 2018).

The magnitude of the teacher's need for an instrument that can measure all the compound intelligence of students, based on an initial survey of 11 teachers of 84% or nine teachers needs an instrument that can measure the entire compound intelligence of students, especially in playing basketball. This means that so far there have been no instruments used to measure the compound intelligence of students, especially in basketball games. This gives great urgency in solving the main problem of developing an MI-based basketball game assessment. By developing MI-based assessment instruments, it is hoped that teachers can provide optimization of the intelligence and abilities of students in high school. Taking measurements about the effectiveness of the developed product will give an idea that the usefulness of the product is very large in sports learning at the high school level. The main objective of developing this product is to produce a valid, reliable, and effective scoring model to measure students' MI ability on basketball game activities.

RESEARCH METHOD

The method utilized in this study aims to answer the problem of the ability of MI-based basketball games in Indonesia. The model used in the development is the ADDIE model

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developed by Molenda in 2003. The ADDIE model is a model that adopts the IPO evaluation model (input, process, output) which consists of the stages: (1) analize, (2) design, (3) develop, (4) implementation, and (5) evaluation (Branch, 2009). In the "analyze" stage, there are three activities carried out, namely: (a) surveying data on the learning conditions of high school PJOK in Kulon Progo Regency, (b) conducting a review of literature relevant to the research, and (c) reviewing relevant research results on the MI assessment model of item response theory (IRT). The "design" phase determines the scope of activities, the development product to be produced, development activities, instrument test subjects, and datais analysis techniques used. At this stage, proposals for development activities will be produced in the form of design identification needs, constructs, and criteria for the instruments developed, including the specification of the objectives and the final product. The "develop" phase includes an outline of instrument design planning and workflow for assessing the MI abilities of high school students. This stage will result in conceptual proposals of instruments, archetypes of assessment procedures, and assessment instruments. Phase i of the application consists of limited group testing activities followed by revision and analysis, until a good assessment instrument is produced. The evaluation stage is a testing activity in a group with a larger scale and instrument revision activities. This stage will result in the final product and the final revision of the design of the MI-based basketball game assessment instrument. The advanced stage which is the final stage is the stage of presenting or disseminating instruments to users, namely PJOK teachers at the high school level, principals, district/city education offices, and provincial education offices. Furthermore, feedback will be obtained, for the improvement of the resulting instrument. The result of this stage is the effectiveness of the product that has been used by the user as feedback.

Instrument Trials

Small-scale trials are carried out to determine the quality of the test instruments and analyze both qualitatively with expert judgement in terms of content, construction, and language aspects, as well as quantitatively through the trial process. Limited trials were conducted to see the quality of question items using the R program. Limited trial subjects will be conducted to 174 class X students consisting of four classes at SMAN 1 Temon, Kulon Progo, Yogyakarta. Expanded trials were conducted to prove the reliability of the instrument and the effectiveness of the instrument. By adding a subject will be able to increase the validity and reliability of the instrument. Determination of the number of samples using *purposive random sampling* technique, which is the determination of the number of samples based on a certain number. The *sampling* method used is based on the Slovin formula with a significancy level of 0.05. With the total population in DIY Province is 57,916 students (Local Government Agency, 2021). The expanded trial subjects were conducted to 1053 students in five high schools in Yogyakarta. The five schools sampled are at the High School level which has a middle quality level. Quality is seen from the *inputs*, accreditation, and outputs, and achievements possessed by the school.

Data Collection Procedure

The methods used to identify problems and needs are tests, observations, in-depth interviews, distribution of questionnaires, documentation of research results, and discussions. In addition, data were obtained through advice from measurement experts, sports psychology experts, and sports coaching experts both in oral form (input in meetings) and questionnaires (written input). This discussion method is recorded and implemented in the assessment of MI-based basketball games which has been refined to be transformed into the form of an MI-based basketball game assessment instrument. Data analysis is carried out by various methods. The first step is to use the qualitative analysis method, which aims to build an instrument design (content validity), compiled based on indicators built from theory. The preparation of

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drafts and indicators of research instruments is carried out by compiling question items and instruments based on theoretical studies and previous research studies. After all is arranged in a draft instrument the next is done in Delphi. The indicators created from research instruments is shown in Table 1.

Table 1. MI-Based Basketball Instrument

No.	Indicators	Sub-Indicators
1.	Linguistics	Understanding communication in basketball games Practicing sound of language
2.	Mathematics	Understanding game time Understand causalities Understand/know the quantification of the score Understand the angle of the shot in the game
3.	Spatial	Understand the area of the basketball court Estimating the inner step towards the ring Able to estimate passes to teammates
4.	Kinesthetics	Coordination of the body Body processing skills Flexibility Speed Responsiveness
5.	Musical	Able to understand the sound of game codes Musical reactions
6.	Interpersonal	Able to communicate Negotiation Given motivation
7.	Intrapersonal	Self-motivation Discipline in everyday life
8.	Naturalistic	Healthy/natural Able to adapt to the new arena
9.	Existence	Pray to God Calm down Sportive

FINDINGS AND DISCUSSION

Findings

Product Description

The observation instrument consists of 28 items, each of which represents an indicator of the aspect of compound intelligence; namely: (1) linguistics, (2) mathematical logic, (3) spatial visual, (4) kinesthetic, (5) music, (6) interpersonal, (7) intrapersonal, (8) naturalistic, (9) existence. The observation instrument consists of four criteria from each item of observation (using the Likert scale). The product effectiveness instrument consists of 12 questions in the form of a questionnaire. The questionnaires used have indicators consisting of: (1) ease, (2) content, (3) effectiveness, (4) completeness, (5) novelty, and (6) satisfaction. Each indicator consists of two items of statements with a Likert scale of four options: (1) strongly agree, (2) agree, (3) disagree, and (4) strongly disagree.

V-Aiken Analysis Results

Proving the validity of the contents is carried out by calculating the V-Aiken coefficient with five experts to assess the content of the instrument. The content of the instruments seen

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is the language aspect and the theoretical aspect. In assessing the instrument, it is carried out using the Delphi method, which is to distribute the formular to experts and then the results of the filling in the form of a four-scale ordinal assessment (Likert) are analyzed with the V-Aiken formula. The results of the V-Aiken calculation analysis are described in Table 2.

From Table 2, it is illustrated that the results show that the Aiken Validity on each item is above 0.5, meaning that all items on the observation instrument are worthy of trial. As for the average validity of Aiken as a whole, it is 0.926, meaning that the V-Aiken coefficient in observation instruments is classified as very high

Table 2. V-Aiken Results Analysis

No.	Indicators	V-Aiken
1.	Lingusitic (Manipulating grammar)	0.86
2.	Linguistics (Phonology or phonology)	0.93
3.	Linguistics (Semantics or meaning of language)	0.86
4.	Linguistics (Pragmatic dimension or practical use of language)	0.8
5.	Mathematical Logic (Categorization or classification)	0.8
6.	Mathematical Logic (Inference)	0.86
7.	Mathematical Logic (Generalization)	0.8
8.	Mathematical Logic (Hypothesis testing)	0.8
9.	Mathematical Logic (Calculation)	0.93
10.	Spatial (Observation of the reality of objects)	0.93
11.	Spatial (Organizing information against objects)	1
12.	Kinesthetic (Coordination)	1
13.	Kinesthetic (Balance)	1
14.	Kinesthetic (Flexibility)	0.93
15.	Kinesthetic (Strength)	0.93
16.	Kinesthetic (Speed)	0.93
17.	Music (Reaction to rhythm)	1
18.	Music (Reaction tone)	0.93
19.	Interpersonal (Feelings)	0.86
20.	Interpersonal (Motivation)	0.93
21.	Interpersonal (Temperament)	0.93
22.	Interpersonal (Intention)	1
23.	Intrapersonal (Encouraging yourself)	0.93
24.	Intrapersonal (Developing discipline)	0.93
25.	Naturalist (Response to the environment/adapt)	1
26.	Naturalist (Response to the environment/adapt)	1
27.	Existence / Religion (Meaning of noble goals)	1
28.	Existence / Religion (Meaning of noble goals)	1
	Average	**0.926**

Validity of Constructs

The results of descriptive statistical analysis showed that the total data was 122 students with a total average of 87 with a total variance of 14.07 and the standard deviation was 3.75. Meanwhile, the results of KMO & Bartlett's dimensional test data showed a result of 0.561. This means that the KMO & Bartlett's test shows that the instrument is feasible for unidimensional testing.

Unidimensional tests were performed by factor analysis using the SPSS 25 program. Before conducting a factor analysis, feasibility testing was carried out using the KMO-MSA test and Barlett's test on each instrument. According to Anderson (2003), the requirement for factor analysis is Kaiser-Meyer Olkin (KMO) – MSAU > 0.5 and significant unidimensional barlet tests mean that each test item measures only one ability to test unidimesion by factor analysis. The results of the KMO and Bartlett analysis were less than 0.05. The KMO-MSA test is used to see the adequacy of the sample, while Bartlett's test for the normality of the data used. The results of the trial can be described in Table 3.

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Table 3. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.561
Bartlett's Test of Sphericity	Approx. Chi-Square	1646.362
	df	378
	Sig.	0.000

In the explanation of Table 3, the results of empirical analysis with KMO-MSA values are 0. 561 or more than 0.5 and the Barlett.s test signification is 0.000. Thus, it can be concluded that all the results of the analysis have been significant, meaning that the instrument is feasible for factor analysis. To obtain items that measure the same dimensions, an extraction process is carried out so that several factors are generated. Each factor formed has an eigenvalue, and factors that have an eigenvalue above 1.00 are maintained (Santoso, 2017).

According to Swaminathan et al. (2006), unidimensional assumptions are considered fulfilled if the test contains one dominant component that measures someone's ability. The same statement was put forward by Naga (2004) who stated that if in measure-ment finds one dominant dimension, then that dominant dimension becomes a single dimension or unidimensional on the response or item characteristic. Furthermore, if the eigenvalue of the first factor has a value up to several times the value of the eigen, the second factor and so on is almost the same, then it is said that the unidimensional conditions are conducted.

Table 4. Total Variance and Eigenvalues

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.473	15.974	15.974	4.473	15.974	15.974	3.063	10.938	10.938
2	3.443	12.295	28.269	3.443	12.295	28.269	2.929	10.461	21.398
3	2.456	8.770	37.039	2.456	8.770	37.039	2.564	9.158	30.557
4	2.046	7.309	44.348	2.046	7.309	44.348	2.251	8.040	38.597
5	1.608	5.741	50.089	1.608	5.741	50.089	2.051	7.325	45.922
6	1.366	4.878	54.967	1.366	4.878	54.967	1.716	6.129	52.050
7	1.283	4.584	59.550	1.283	4.584	59.550	1.569	5.603	57.654
8	1.183	4.223	63.774	1.183	4.223	63.774	1.445	5.162	62.816
9	1.138	4.065	67.839	1.138	4.065	67.839	1.407	5.024	67.839
10	.963	3.441	71.280						

The total variance is known in Table 4. The 6 2.687 % in the first component which can be interpreted this instrument measures one aspect with a dominant eigenvalue of 36.741 meaning that the instrument developed only measures one dimension of capability. The results can then be seen in the Scree Plot exploratory factor analysis described in Figure 4.

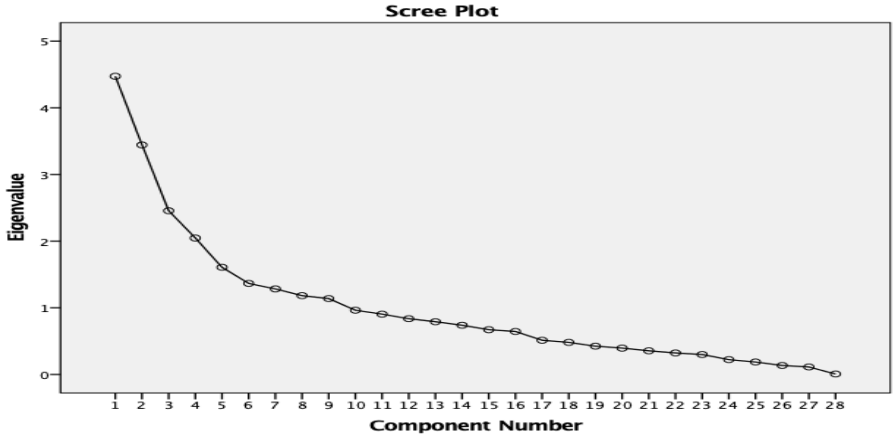

Figure 1. Unidimensional Scree Plot

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Instrument Reliability

The next step is to analyze the items using SPSS to see the reliability of the developed instrument. The parameter used to determine reliability is to look at the Alpha Cronbach value in each output table obtained, provided that if the Alpha index is greater than 0.7 ($\alpha > 0.7$), then the instrument is reliable (Taber, 2018). The results of the Alpha coefficient in the limited-scale trial showed a value of 0.865 (>0.7), meaning that the instrument built already met the high reliability requirements. The results of the reliability coefficient of the observation instrument are presented in Table 5.

Table 5. Reliability Test Results

Cronbach`s Alpha	Cronbach`s Alpha Based on Standardized Items	N of Items
0.704	0.703	28

Component Reliability

The next analysis is to compare the reliability of the two instruments per component using the reliability of composite scores seen from each sub-component or indicator that builds both observation and test instruments. Reliability of composite scores is a method done by estimating reliability based on the score of each component. The estimation of each reliability score that has a high score is expected to have an effect or impact on its total reliability.

The composite reliability value or Average Variance Extracted (AVE) can be used to determine the reliability of each latent variable, where the component loading is to the indicator and variance. The nature of the composite reliability is closer approximation assuming the parameter estimates are accurate. When compared to Alpha Cronbach, this measure does not assume the equivalence between measurements assuming all indicators are given the same weight (Rigdon, 2012). Thus, comparing reliability between Cronbach's Alpha method and composite scores is necessary to test the internal consistency of an instrument, where the component loading is to the indicator and variance. The nature of the composite reliability is closer approximation assuming the parameter estimates are accurate. The results of calculating reliability by the composite score method as presented in Table 6 show that the product is very reliable. The reliability results of the composite score show a value that matches the criteria of a good instrument, which is >0.5, while the overall instrument reliability result is 0.808 or falls into the "good" category.

Table 6. Reliability Results of Composite Scores for Each Component

Components	Reliability
Existance	0.713
Interpersonal	0.648
Intrapersonal	0.688
Kinesthetic	0.659
Linguistic	0.522
Mathematic	0.633
Music	0.769
Naturalistic	0.725
Spatial	0.619
Multiple Intelligences Test	0.808

Second-Order Construct Model

The development of a conceptual model with some basic theories taken from Howard Gardner which was developed again from seven compound intelligences developed into nine compound intelligences. The instrument specification consists of 28 observed items and each has four Likert scale categories.

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The next step is to look at the criteria of the covariance of each item. A good amount of covariance (factor loading) is >0.3. From the 28 items of MI performance instruments, it shows that the entire value of the loading factor of the items against the indicator is above 0.3. Thus, it can be concluded that the construct of *multiple intelligences* performance instruments is feasible to use. The recapitulation of the CFA results of the *Multiple Intelligences* test instrument is shown in Table 7. The results of the construct validity are then strengthened by the results of the Confirmatory Factor Analysis using SmartPLS are shown in Figure 2.

Table 7. Item Categorization

Category	Item
Valid	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28
Not valid	-

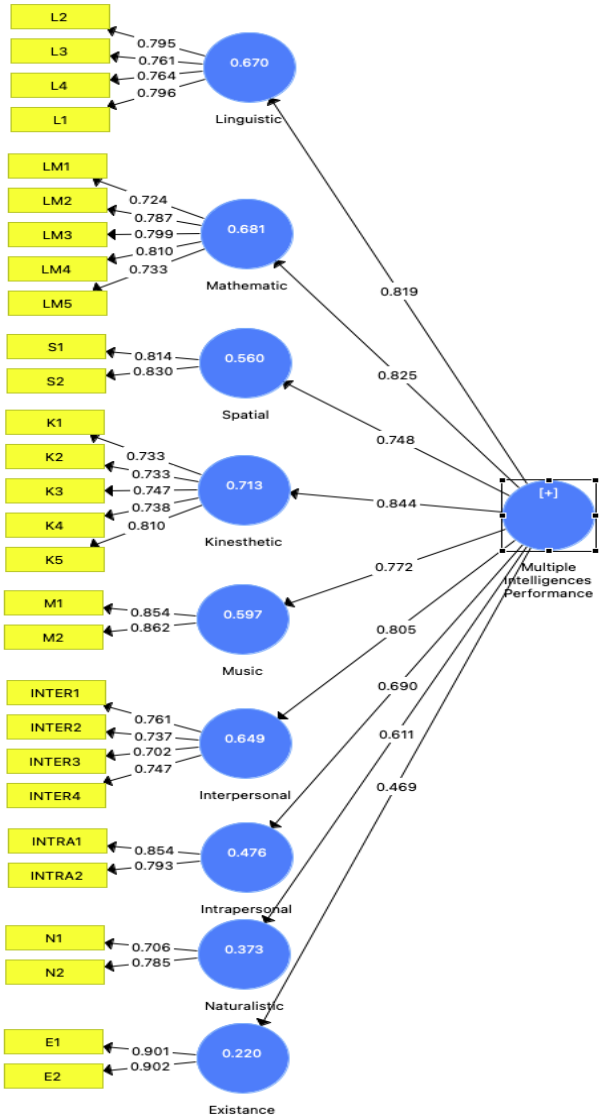

Figure 2. Path Diagram Model

The path diagram with the second order illustrates a good instrument construct with a loading factor value of >0.3. Of the 28 observation items, the whole has met the criteria, with a high covariance value. Thus, it can be concluded that construct tests proved models developed according to the theory.

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Fit Model

The step to prove the fit of the developed model is to look at the goodness of fit (GoF) test. Used to provide validation of the combined performance of the measurement model (outer model) with a structural model (inner model) whose value stretches between 0-1 with an interpretation of 0-0.25 (small GoF); 0.25-0.36 (moderate); and >0.36 (large).

Table 8. Model Fit Summary

	Saturated Model	Estimated Model
SRMR	0.116	0.119
d_ULS	21.479	22.665
d_G	n/a	n/a
Chi-Square	infinite	infinite
NFI	n/a	n/a

Table 8 shows that between *saturated* model and *estimated* model has the difference in SRMR (square root) is the large difference between the data tested and the model. The data shows that the value between the data and the model is 0.00 3 adrift meaning that there is very little difference between the data and the model. Thus, it is concluded that the data tested is fit with the model. The next criterion is d_ULS which is a measure that measures how strongly the empirical correlation matrix differs from the implied model correlation matrix. From the output data, it shows that the difference between the empirical matrix and the model has a difference of 1.186 so it can be concluded that the difference is very small with a score of 21.479 (> 2.00), which means it falls into the very good category. From the results of the analysis shows that all empirical test criteria indicate the data is fit against the developed model.

Table 9. Results of Items Analysis

No.	Item	Outfit	z.outfit	Infit	z.infit
1.	L1	0.852	-3.178	0.879	-2.936
2.	L2	0.855	-3.274	0.896	-2.479
3.	L3	0.876	-2.507	0.915	-1.913
4.	L4	0.908	-1.958	0.939	-1.421
5.	LM1	1.071	1.653	1.094	2.249
6.	LM2	0.853	-3.418	0.887	-2.616
7.	LM3	0.847	-3.649	0.877	-2.975
8.	LM4	0.814	-4.478	0.840	-3.972
9.	LM5	0.877	-2.785	0.914	-2.089
10.	S1	0.940	-1.424	0.971	-0.670
11.	S2	0.884	-2.400	0.922	-1.795
12.	K1	0.896	-2.352	0.934	-1.560
13.	K2	1.074	1.541	1.016	0.390
14.	K3	1.077	1.568	1.008	0.199
15.	K4	0.869	-2.836	0.904	-2.270
16.	K5	0.765	-5.395	0.803	-4.817
17.	M1	0.837	-3.327	0.868	-3.005
18.	M2	0.836	-3.598	0.866	-3.147
19.	INTER1	0.926	-1.252	0.974	-0.515
20.	INTER2	0.834	-3.563	0.863	-3.297
21.	INTER3	1.025	0.457	1.092	1.897
22.	INTER4	0.937	-0.969	0.933	-1.412
23.	INTRA1	0.903	-1.819	0.933	-1.475
24.	INTRA2	1.010	0.152	1.036	0.686
25.	N1	1.308	2.828	1.266	4.004
26.	N2	1.288	5.550	1.252	5.548
27.	E1	1.151	1.623	1.210	3.362
28.	E2	1.220	2.421	1.248	4.027

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Analysis to determine the characteristics of observation instruments is carried out by the IRT (Item Response Theory) method with the Rasch Model method. The analysis was carried out using the R program using infit and outfit analysis. INFIT and OUTFIT values are for testing the precision of items with the model. In the Quest it is specified that an item will fit the model if the INFIT MNSQ value ranges from 0.77–1.33 (Mohamad et al., 2015). There are also those who use testing based on INFIT t values, which use a range between -2 to +2 (Bond et al., 2007). The results of the analysis of the items with IRT are shown in Table 9. Table 9 shows that a good INFIT MNSQ result is between 0.77 and 1.33. From these results, it can be concluded that all items on 28 items are included in the good and valid category.

After the item fit analysis with IRT, an ICC (Item Characteristic Curve) will be formed. The ICC curve shows how the position between the four lines is showing slope which means that this observation instrument is suitable for learners with an ability of -2.8 to 1. It means that the instrument is very suitable for use by students who are beginners in playing basketball. Figure 3 shows an ICC image of each item of the alert item.

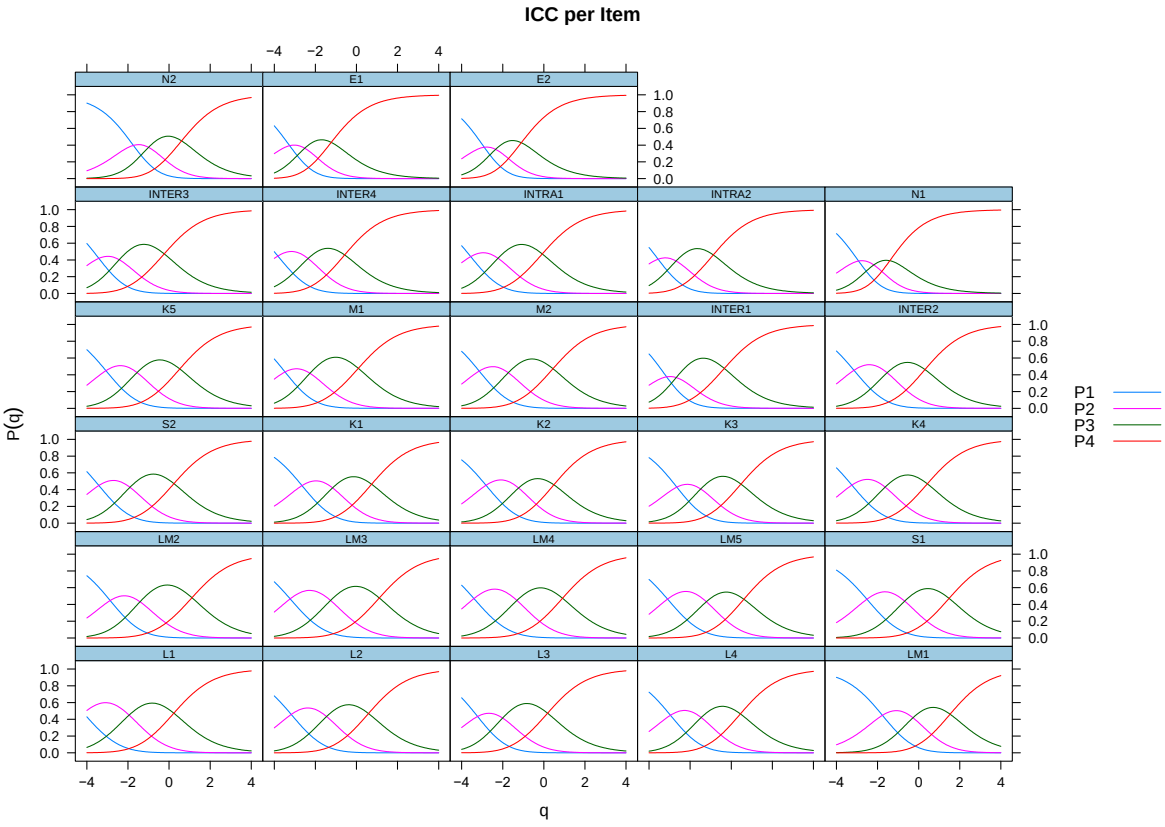

Figure 3. Characteristic Curve Item per Item

The next step is to look at the function of the question item information. By looking at the function of item information, it will be possible to see how the graph of the ability to play basketball from each item of alert. The result of the curve image of the information function of each item is described in Figure 4.

After looking at the characteristics of each item both from the ICC and its information function, the instrument information function as a whole will be seen. This basketball game's *Multiple Intelligences* observation instrument fits perfectly with the learner's ability between -4. 817 to 2. 24. Furthermore, the total information function can be known from the slope by intercept describing the developed instrument according to the ability of low participants or beginners and participants with intermediate abilities.

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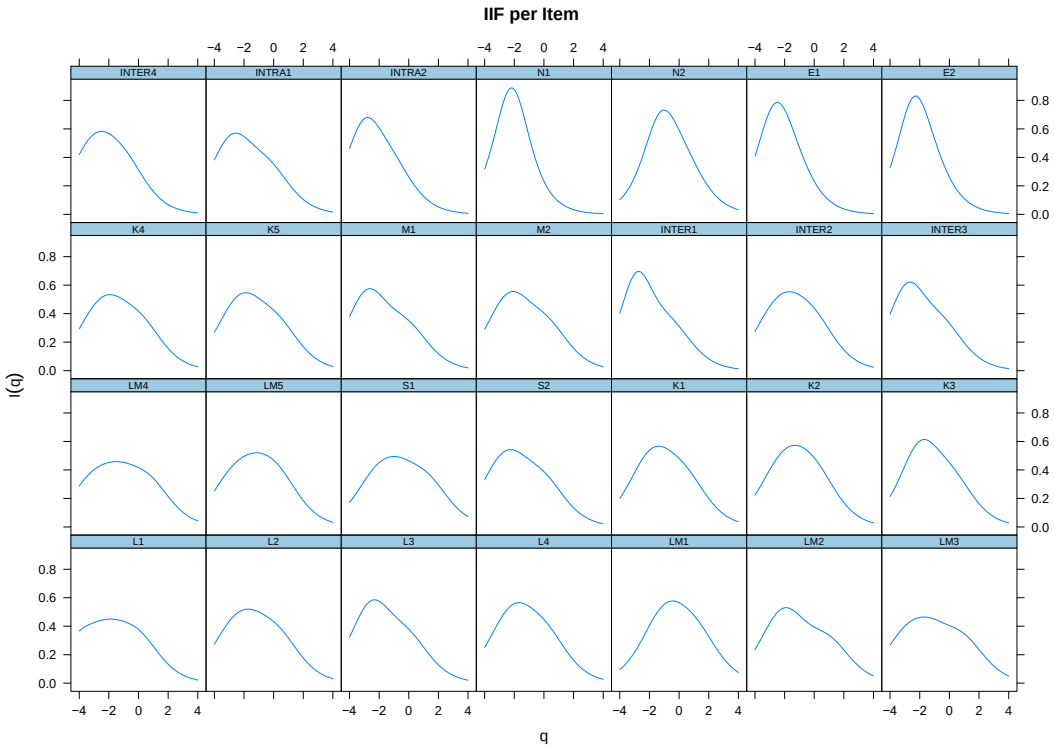

Figure 4. Item Information for Each Item

Product Effectiveness

The final step in developing a product is to look at the effectiveness of the product. In this case, post-observation data collection is carried out, namely to the subject teacher. There are 12 items of statements to assess the effectiveness of the product. The following is a presentation of descriptive statistical data from the assessment of the effectiveness of Multiple Intelligences products in basketball games.

The results showed that in terms of ease of assessing MI by teachers with 50% "strongly agree" and 50% "agree". This means that the MI instrument provides convenience in assessing the ability of Multiple Intelligences of high school students. While it is easy to use, the data shows 25% "strongly agree"; 50% "agree" and 25% "disagree". It means that although there are still 25% who disagree, 75% think that the MI instrument is easy for PJOK teachers to use.

Data about the content is described into two items of statements. The first item is conformity with the PJOK curriculum in high school. With the result that 50% of teachers "strongly agree" the instrument is relevant to the K13 and BMKM curricula. Meanwhile, 50% of teachers think they "agree" on the relevance between the instrument and the implemented curriculum. It can be concluded that the content of the developed instruments is very relevant to the PJOK curriculum in high school.

The next indicator is about the effectiveness of the product. Assessments conducted with MI instruments can significantly improve the MI abilities of learners. The teacher's response showed that 25% answered "strongly agree"; 25% answered "agree" and 50% answered "disagree". Thus, it can be concluded that there has been no experimental research related to the effect when assessment is applied to students, especially in basketball games, which can improve their MI abilities. The next indicator is an instrument that is developed effectively in improving the capabilities of MI. Respondents provided data that 25% answered "strongly agree" and 75% answered "agree". It can be concluded that all teachers think that the assessment instrument is indeed appropriate to see the MI ability of students.

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The next indicator is completeness, that is, the first item about the instrument used to measure MI is complete and comprehensive with a value of 75% "strongly agree", and 25% "agree". This means that 100% of respondents agree that the instruments used are complete and comprehensive. The next point is about the scope of the instrument is nine compound intelligences. Results show that 50% of respondents "strongly agree", and 50% "agree". Thus, the developed instrument already includes aspects of nine compound intelligences.

The next indicator is about novelty. The authenticity aspect consists of two items, namely "having novelty value" and " there is a differentiator from existing MI instruments". The indicators of novelty indicate 50% "strongly agree" and 50% "agree". It is concluded that the novelty aspect of the instrument is very noticeable. The next aspect is the differentiator with other MI instruments, resulting in 100% of respondents chose "agree" which means that there has never been an MI instrument developed within the scope of the basket-ball game.

The latter indicator is "satisfaction", which consists of two items, namely "satisfying the user" and "providing facilities to the teacher". The item condemns users (teachers and learners) with a result of 25% "strongly agreeing" and 75% "agreeing". Thus, it can be concluded that the developed instruments satisfy users, especially teachers and students. The last item is "providing facilities to teachers" with a result of 25% "strongly agreeing" and 75% "agreeing". Therefore, it can be concluded that 100% of users, both teachers and students, are satisfied and facilitated by the presence of developed instruments.

Discussion

Product feasibility test with content validity analysis showed that out of the five selected experts used the Delphi method in its analysis. The result was (1) the observation instrument showed the total V-Aiken value was 0.926. It means that the product is declared suitable for use on a wide scale. The results of the research and development obtained are similar with the results of Abdulmohsen (2018), which is looking for the influence of strategies for the use of multiple intelligence theory on the development of basketball ability. As a result, learning programs applied to control groups can improve compound intelligence. Likewise, active learning methods can be applied to improve the MI of basketball games in high school. Pratama (2017) examined the relationship between physical body-kinesthetic motion ability (multiple intelligences) and student learning outcomes. The results showed that there was no significant difference between the control class and the experiment that affected the learners' multiple intelligence ability. It is implied that the improvement of MI capabilities needs to be based on a habituation program according to the potential and talents of each individual. The results of the analysis of the contents and constructs validity for the Multiple Intelligences observation instrument showed good results and were in accordance with the criteria, so the next process could be carried out, namely an expanded trial with respondents from five schools throughout the Province of the Special Region of Yogyakarta with representatives of each district being one school. Meanwhile, the reliability coefficient of each component is obtained a value of more than 0.6 so that it can be concluded that the reliability value of each component has a good category. There are 28 qualifying items for the MI assessment instrument of the basketball game, but for the test instrument only 27 items are eligible for the construct validity criteria, which means that there is one item that is discarded because it has a low loading factor (0.3>). Pérez et al. (2014) also developed instruments to assess different intelligences, namely musical, interpersonal, intrapersonal, kinesthetic-physical, social, naturalistic, spiritual, spatial, and mathematical. The results obtained from the nine aspects of intelligence developed showed valid and reliable trial results, although in this study there was one test item whose results were invalid.

All instruments already have constructs that have been tested empirically, namely with the Confirmatory Factor Analysis (CFA) test with P-Value criteria and the mean square outfit

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has been good so that the instrument can be said to be fit with the model. It is in line with Setiawan et al. (2020) who developed an instrument for assessing MI in kindergarteners. The relevance to this research is that in the aspect of MI studied, there are nine intelligences that will be observed in this development research. Furthermore, with instruments developed in accordance with the procedure, the assessment results obtained will also be optimal in developing MI abilities in students in high school.

The reliability coefficient uses Cronbach Alpha with each observation instrument result of 0.704. Meanwhile, to see the reliability of each component using the validity of composite scores, the results of which both observation instruments and test instruments have met the reliable requirements (>0.5). The fit test of the developed product model shows that between saturated model and estimated model has the difference in SRMR (square root) is the large difference between the data tested and the model. The results of modern instrument item analysis using IRT show that the Multiple Intelligences observation instrument of this basketball game is very suitable for the abilities of students between -4.817 to 2.24.

The results of the product effectiveness assessment of six criteria, namely convenience, content, effectiveness, completeness, authenticity, and satisfaction showed a high value, namely 38% of users felt "very satisfied", 56% of users felt "satisfied" and 6% of users felt "dissatisfied". The assessment guidelines for this MI-based basketball game have been made in full of instructions for use and scoring instructions. This is based on limited trials and extensive trials meaning that it has achieved product development goals. The effectiveness of MI-based basketball game assessment products shows a very high category. This proves that the form of the final product development report can be used well by PJOK teachers.

This research suggests that aspects of developed compound intelligence can be adjusted between indicators and learning objectives. With learning objectives that are in accordance with the abilities and interests of students, the MI aspect can develop. This is relevant to some previous research (Berlian et al., 2020; Ernawati et al., 2019; Şuruba-Rusen (Vasiliu) et al., 2020) which resulted in the theory put forward that teachers can adjust learning methods according to the eight aspects of compound intelligence to be developed.

CONCLUSION

The conclusions of the study showed that: (1) Product feasibility test with content validity analysis showed that out of the five selected experts used the Delphi method in its analysis. The result was that the observation instrument showed the total V-Aiken value was 0.926. This means that the product is declared feasible for instrument trials. (2) The validity of the construct shows the value of the reliability efficiency using Cronbach Alpha 0.704. Meanwhile, to see the reliability of each component, it uses the validity of the composite score with a result (>0.808); (3) the fit test of the developed product model shows that between saturated model and estimated model has a difference in SRMR (square root) is the large difference between the data tested and the model. The results of modern instrument item analysis using IRT show that the MI observation instrument of this basketball game is very suitable for the abilities of students between -4.817 to 2.24; (4) The results of the product effectiveness assessment of six criteria, namely convenience, content, effectiveness, completeness, authenticity, and satisfaction showed a high value, namely 38% of users felt "very satisfied", 56% of users felt "satisfied" and 6% of users felt "dissatisfied". The results of measuring the ability of participants showed that the results of MI capabilities that were in the "High" category were 568 or (55%) of the total number of samples, the ability of "Medium" were 358 (35%) of the number of participants. Last but not least is the "Low" category with a total of 103 (10%) of the number of test takers. Suggestions and recommendations from the results of product development in this research can be developed more deeply and socialized to various educational professional organizations in the country so that their benefits will be greater.

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