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Students Proactive Decision-Making Scale (SPDMS-18)

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Abstract

This study uses the analysis, development, implementation, and evaluation research design to innovate the student proactive decision-making scale. Considering the needs analysis, the researcher constructed 18 items validated by five raters and tested on 849 students from various universities in Indonesia. The content validity test used Aiken's formula, and the inter-rater reliability test used Pearson's ICC. While the construct validity and reliability test used CB-SEM analysis, and the concurrent validity test used Spearman's correlation between SPDMS-18 and Melbourne DMQ. The results of content validity proved that 18 items met Aiken's parameters (0.80-1.00), Pearson's ICC value = 0.524, and Cronbach alpha value = 0.846. Construct validity testing proves that the SPDMS-18 loading factor values range from 0.709-0.835, Cronbach alpha values range from 0.752-0.835, composite reliability values range from 0.751-0.839, AVE values range from 0.502-0.634, and discriminant validity values range from 0.709-0.797. The GoF test model proves that the Chi-Square/df value = 3.002, RMSEA value = 0.049, SRMR value = 0.027, NFI value = 0.958, TLI value = 0.963, and CFI value = 0.971. The concurrent validity results using Spearman's correlation confirmed the sig. value = <0.001. Thus, SPDMS-18 has a significant psychometric function with the actual situation. It becomes one of the references lecturers can use to measure, assess, and evaluate students' proactive decision-making in lectures.

Keywords:

Cognitive Proactive;
Personality Proactive;
Proactive Decision-Making;
Students Proactive Decision-Making.

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1- Introduction

Decision-making is at the core of every human response [1] as it is one of the basic cognitive processes of human behavior about a preferred choice or set of actions selected from a set of available alternatives based on specific criteria [2-4] in daily tasks [5]. Making personal or work-related decisions is integral to everyone's life [6]. It is not limited to enormous responsibility for the person's interests but also has implications for the organization, its peers, and other stakeholders [7]. A person's current decision will affect their future life [8], so they must carefully identify and select some information, data options, and activities based on specific values and preferences [9] to ensure that the actions they take every day, week, month, and year support the competencies they expect. Considering that every day humans deals with various choices and decisions. Decision-making has been seen as one of the key components of life skills, so that decision-making skills need to be intentionally integrated into the context of education and students learning [10-12]. Training students' decision-making abilities will be useful for them to fulfill individual and collective goals [13], consensus building [14], behavior management [15], improve leadership performance [16], as well as academic achievement [17-19].

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Simon's rational theory model [20] offers four stages of decision-making, starting from intelligence, namely finding opportunities to make decisions; design, namely analyzing, creating, developing, and possible actions; choice, namely determining specific actions from available actions; and review, namely assessing previous choices. Meanwhile, Carroll and Johnson's normative model theory [21] offers six decision-making stages: identifying problems, developing criteria, generating alternatives, evaluating alternatives, choosing solutions, acting, and monitoring. Both theories emphasize that in making decisions, a person needs an analytical and critical thinking process about a series of selected activities, from assessing problems, collecting and analyzing information and data, evaluating and developing developed alternatives, and choosing the right alternative [22]. Unfortunately, the two theoretical models above have not referred to specific goals according to future needs. Without specific goals, the problem identification process only adds to the list of unfocused work, causing decision-making to be uncritical, off-target, and certainly not supporting achieving goals. Individuals will continue to be busy with uncontrolled problem-solving efforts by their goal orientation. It will attract a lot of individual thought, mental, and energy incentives but is less effective and efficient and even hinders the accuracy and speed of goal achievement. Observing the limitations of the rational model theory and normative model theory, researchers have begun to develop and campaign for various decision-making models using cognitive skills and personality traits theories such as proactive decision-making (PDM) [23-26].

The general decision-making model postulates that problem-solving responses are triggered in reaction to stimulus presentation when accumulated stimulus evidence reaches a decision threshold made through intuitive or rational processes or a combination of both [27]. The reactive decision-making model places individuals as passive, reacting, and adapting individuals limited by environmental responses; individuals do not form their own decisions [28]. In contrast, the proactive model acts early on to idealize future situations. This framework allows proactive responses independent of stimuli. Proactive decision-making is a concept introduced into behavioural operational research and decision analysis, which discusses effective proactive decision-making during the alternative generation phase [26]. Individuals consider their future events when making their current decisions; they project them before they happen. Proactive individuals have a vision that guides them about what they want to achieve in the future [6, 26] so they design more organized learning behaviours to achieve their vision. Proactive individuals begin the decision-making process with the systematic identification of objectives stage, so they must first determine their future vision (goal orientation) before filling their decisions with various activities that are relevant to achieving those future goals. It emphasizes that it is vital for individuals to observe how critically they evaluate their abilities in proactive decision-making to become more effective and efficient in achieving their goals [1].

Researchers have so far developed proactive scales, such as the Proactive Coping Inventory [29], the Proactive Attitude Scale [30], The Italian Scale of Proactive Personality [31], the Multidimensional Proactive Decision-Making Scale [6], Adaptation of R. Schwarzer's Proactive Attitudes Scale [32], Proactive Personality Scale [33]. The Multidimensional Proactive Decision-Making Scale by Siebert & Kunz [6] is more effective in assessing a person's decision-making because all individual decisions are based on their goal orientation process. Individuals make decisions by systematically creating various alternatives and guiding methodical information searches to their predetermined goals. Then, individuals identify alternatives that increase their chances of achieving their goals, establish relevant values that guide the collection of information and data before making from previously determined alternatives, consider other decisions strategically that focus on their future goals, proactively take the initiative to make decisions and try to improve previous decisions to make the best new decisions. If we look closely at the PDM formulation by Siebert & Kunz [6], the formulation of their items is more general, which may provide different interpretations based on cultural context and the modality of thinking skills. For example, the formulation of items on the objective indicator, "*I try to be clear about my objectives before choosing*," or on the improvement indicator "*I continually try to improve my current situation*." Therefore, this study offers a more operational and contextual PDM scale construction on students' academic performance attending lectures.

Lectures should provide dual benefits for students, allowing them to be equipped with proactive skills in making future decisions. These skills are not only valid in the lecture process but also become important capital for students because PDM has been recognized as a life skill that is always needed. One of them is that PDM trains students so that when they start lectures, they are proactive in learning and identifying what the curriculum will be during one semester of lectures and even after finishing their studies, how they learn it, and how the evaluation of academic performance and learning outcomes that lecturers use. Thus, this study aims to develop a student proactive decision-making scale to help lecturers and/or students assess and evaluate the use of learning models that can promote and project the development of student PDM as an effort to prepare them to become proactive people towards developing their competencies.

2- Method

The instrument research and development method uses the ADDIE formula developed by the Branch [34], namely Analyze, Design, Develop, Implement, and Evaluate.

2-1-Analyze

This stage is the process of diagnosing performance gaps. It can be done with various strategies, including the literature review results and empirical needs for specific instructions. This analysis is based on the need for an operational PDM scale for university students or prospective physical education teachers oriented toward their academic performance at home and abroad. Not limited to the development concept, the indicators, the number of items, and others were then reduced to find gaps in the development of the latest scale. We found that proactive decision-making is essential; unfortunately, minimal articles measure and evaluate proactive decision-making (for example, see Table 1), so student proactive decision-making meets the criteria of the needs analysis.

Table 1. A snapshot of the decision-making scale publication analysis (18 years old and over)

No	Scale	Age group	Dimension	Number of items	Developer
1	Melbourne Decision-Making Questionnaire	18 years old and over	Vigilance, hypervigilance, procrastination, and buck passing	22	[35]
2	General Decision-Making Style	18 years old and over	Rational, avoidant, dependent, intuitive, and spontaneous	25	[36]
3	Proactive Decision-Making	18 years old and over	Objectives, alternatives, information, decision radar, initiative, and improvement	19	[6]

2-2-Design

The design stage is the follow-up action from the previous needs analysis results. Researchers designed a proactive decision-making scale based on the concept, dimensions, type of scale, and number of items. The concept and dimensions of decision-making are adopted from Siebert & Kunz [6] (see Figure 1). First, systematic identification of objectives, where objectives serve as the basis for systematically creating alternatives, guiding methodical information searches, and decision planning). Second, systematic identification of alternatives; identifying alternatives increases the likelihood that individuals will achieve their goals by increasing proactive cognitive skills in generating alternatives). Third, systematic search for information, where relevant values guide information gathering in decision-making. Individuals proactively and purposefully seek information to help them evaluate alternatives for achieving relevant values.

Fourth, using a decision radar where individuals can frame their decisions strategically and consider other decisions proactively and in a future-oriented manner. Fifth is taking the initiative, where individuals proactively take the initiative in decision-making. They want to shape their environment actively. Sixth, striving for improvement, proactive individuals strive for "visible effects on self and/or environment." They are interested in creating a meaningful impact by striving for improvement in decision-making situations. The Students Proactive Decision-Making Scale (SPDMS-18) totals 18 items, with the item composition of each dimension/indicator totaling three statement items from each dimension. Respondents responded to the SPDMS-18 using a five-point Likert scale (disagree-strongly agree).

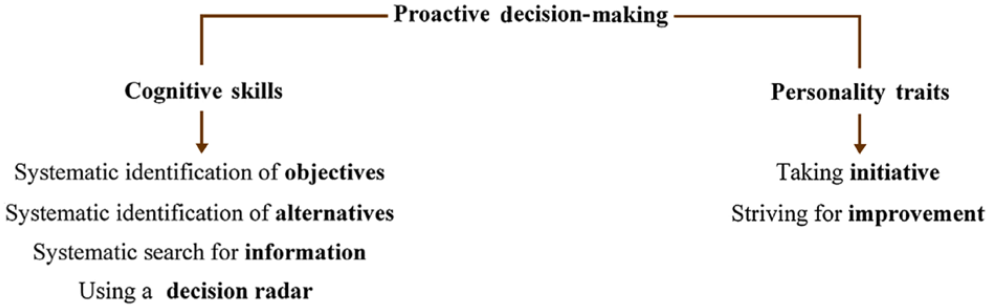

Figure 1. Dimension of PDM

2-3-Develop

The successfully constructed product (student proactive decision-making scale) underwent an initial validation process (content validity). Five raters from various expertise backgrounds, such as policy and leadership, psychology, and thinking skills (see Table 2). Content validity was tested using the Aiken-V formula [37] as well as inter-rater reliability from Pearson's intraclass correlation coefficients (ICC) using norms from Koo & Li [38] with criteria: (1) <0.50 (poor), (2) 0.50-0.75 (moderate), (3) 0.75-0.90 (good), and (4) >0.90 (excellent). The validation results were revised and revalidated until they met the standards or norms of content validity testing, reliability, and inter-rater reliability.

Table 2. Rater committee

No	Education	Gender	Age/work experience (year)	Expertise	Affiliation
1	Prof., Dr., M.Pd.	Male	64/38	Policy and leadership	Universitas Pendidikan Indonesia
2	Prof., Dr., M.Si.	Male	56/25	Psychometrics	Universitas Pendidikan Indonesia
3	Dr., M.Pd.	Female	42/19	Cognitive skills	Universitas Bengkulu
4	S.Psi., M.A.	Female	35/10	Psychology of education	Universitas Muhammadiyah Kalimantan Timur
5	S.Si., M.A.	Female	45/14	Developmental psychology	Universitas Kristen Artha Wacana

2-4- Implement

The implementation stage is to provide university students with a learning environment to test the results of the SPDMS-18 scale development construction (which has met the criteria for content validity and reliability). Researchers provided SPDMS-18 using Google form, which was then disseminated from November 18-21, 2024, to university students in Indonesia affiliated with physical education, health and recreation study programs, sports coaching education, physical education, sports science, and others. The pilot sample was 849 people (male = 568, female = 281; M±SD = 19.8±1.09) distributed from the first semester (40.52%), third semester (26.27%), fifth semester (13.78%), seventh semester (17.90%), and ninth semester (1.53%). The research recruited respondents using a convenience technique, where respondents are a group of individuals who (easily) participate in research, which is not limited to the most approachable and in other ways, or easily accessible to researchers using Google forms [39, 40]. Respondents responded to the scale using a five-point Likert scale (disagree-strongly agree).

Respondents came from various universities in Indonesia, which are not limited to Universitas Kristen Artha Wacana (East Nusa Tenggara Province), Universitas Pendidikan Ganesha (Bali Province), Universitas PGRI Jombang (East Java Province), Universitas Negeri Semarang (Central Java Province), Universitas Negeri Jakarta (Special Capital Region of Jakarta), Universitas Pendidikan Indonesia (West Java Province), Universitas Sriwijaya (South Sumatra Province), Sekolah Tinggi Olahraga dan Kesehatan Bina Guna (North Sumatra Province), Universitas Negeri Padang (West Sumatra Province), Universitas Jambi (Jambi Province), Universitas Riau (Riau Province), Universitas Syiah Kuala (Aceh Province), Universitas Pattimura (Maluku Province), Universitas Tadulako (Central Sulawesi Province), and Universitas Tanjungpura (West Kalimantan Province).

2-5- Evaluate

The evaluate stage includes determining evaluation criteria, selecting evaluation tools, and conducting evaluations to assess the quality of the scale from the developing stage (content validity and reliability) to the implement stage (construct validity and reliability) and concurrent validity using Microsoft Excel, SmartPLS version 4.0.9.9, and SPSS version 29. Descriptive analysis to capture data about the mean and standard deviation of the scale. Furthermore, testing content validity using the Aiken-V formula [37] and content reliability using the Cronbach alpha formula with criteria (1) <0.6 (poor), (2) 0.6 to <0.7 (acceptable for exploratory research), (3) 0.7 to <0.8 (good), (4) 0.8 to <0.9 (excellent), (5) 0.9 to 0.95 (somewhat high), and (6) ≥0.95 (too high; indicators are redundant) [41]. Next, test inter-rater reliability using the formula of Pearson's ICC with the criteria: (1) <0.50 (poor), (2) 0.50-0.75 (moderate), (3) 0.75-0.90 (good), and (4) >0.90 (excellent) [38].

Testing construct validity and reliability using outer model analysis uses the criteria: (1) loading factor >0.70 [42-44], (2) reliability and construct validity, respectively, Cronbach alpha >0.70, composite reliability >0.70 [41, 45], and Average Variance Extracted >0.50 [45], and (3) Fornell-Larcker discriminant validity (root AVE > correlation) [46]. Furthermore, for testing goodness of fit (inner model) we used the criteria of: (1) Chi Square/df <3, (2) Root Mean Square Error of Approximation <0.08, (3) Square Residual Mean Root <0.10, (4) Normed Fit Index >0.90, (5) Tucker-Lewis Index >0.90, and (6) Comparative Fit Index >0.90 [41, 45, 47].

Concurrent validity testing utilized Spearman analysis to correlate SPDMS-18 scores with Mann et al.'s Melbourne Decision-Making Questionnaire (DMQ) scores [35]. The Melbourne DMQ consists of 22 items constructed from four indicators, respectively: vigilance (6 items, α = 0.80), including "*I try to be clear about my objectives before choosing,*" buck-passing (6 items, α = 0.87), including "*I avoid making decisions,*" procrastination (5 items, α = 0. 81), including "*When I have to make a decision I wait a long time before starting to think about it,*" and hypervigilance (5 items, α = 0.74), *including* "*After a decision is made I spend a lot of time convincing myself it was correct.*" The Melbourne DMQ has been tested on a vast population involving 2002 respondents from six countries, such as the USA (n = 475), Australia (n = 251), New Zealand (n = 254), Japan (n = 358), Hong Kong (n = 273), and Taiwan (n = 391). At the same time, the SPDMS-18 reliability test uses the Cronbach alpha formula and norms from Hair Jr et al. (2019), namely: (1) <0.6 (poor), (2) 0.6 to <0.7 (acceptable for exploratory research), (3) 0.7 to <0.8 (good), (4) 0.8 to <0.9 (excellent), (5) 0.9 to 0.95 (somewhat high), and (6) ≥0.95 (too high).

3- Results and Discussion

3-1- Results

This research report begins with content validity and reliability testing, followed by construct validity and reliability, goodness of fit model testing, and concludes with concurrent validity testing.

3-1-1- Content Validity and Reliability

The results of stage 1 validation showed that rater 1 gave a minimum score of 4 (44.4%) and a maximum of 5 (55.6%) with a mean and standard deviation of 4.56±0.51. However, rater 1 provided some revision notes on the SPDM-18 items, such as the note on item nine: "*The word assess may be considered to be replaced with the word examine*." During the revalidation, the minimum score (4) decreased to 27.8%, and the maximum score (5) increased to 72.2%. In addition, rater 1's revalidation also found a mean and standard deviation of 4.72±0.46 with a gain of 0.17 (17%) (see Figure 2).

Rater 2 gave a minimum score of 4 (33.3%) and a maximum of 5 (66.7%), with a mean and standard deviation of 4.67±0.49. Rater 3 gave a minimum score of 4 (22.2%) and a maximum score of 5 (77.8%), with a mean and standard deviation of 4.78±0.43. Rater 4 gave a minimum score of 4 (22.2%) and a maximum of 5 (77.8%), with a mean and standard deviation of 4.78±0.43. Some notes from rater 4 included item 1: "*Comprehensive terms must be confirmed to the subject whether they understand.*" Specifically for raters 2-4, until the specified time limit for revalidation, they did not do so due to various considerations, so the researcher continued to use the stage 1 validation scores in the stage 2 validation (revalidation) test (see Figure 2).

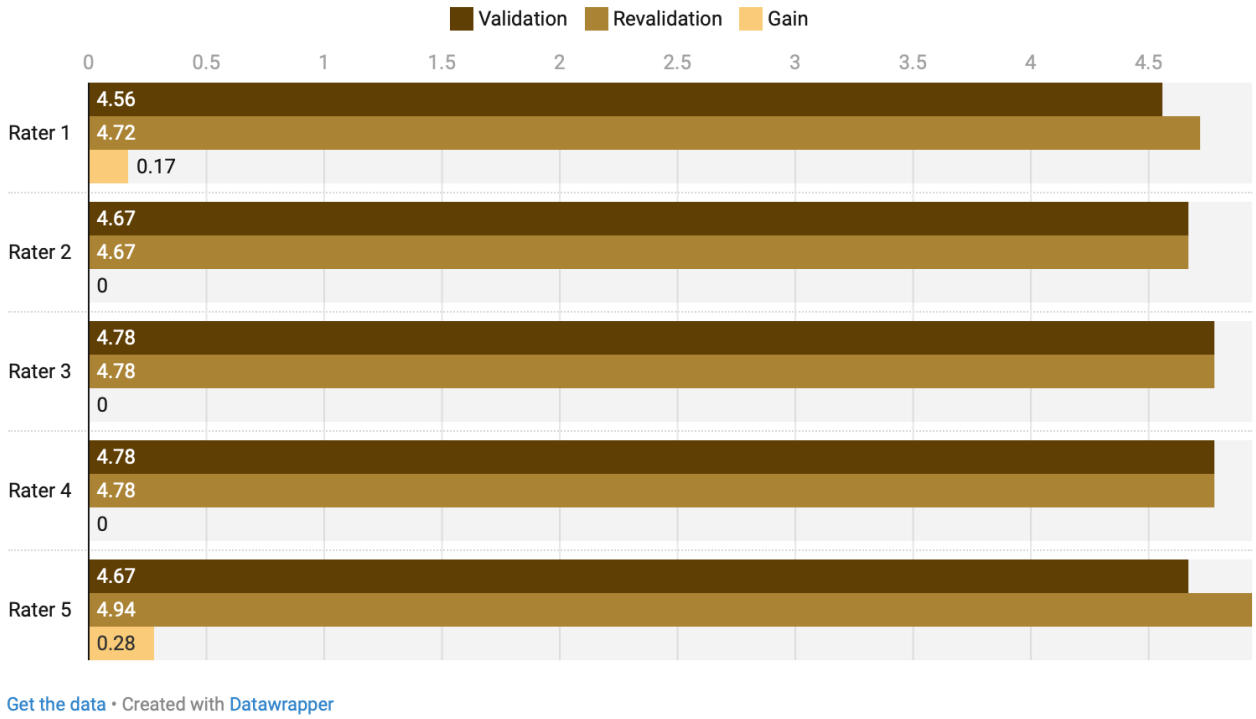

Figure 2. Mean and gain SPDMS-18 (based on raters)

Furthermore, in the first validation stage, rater 5 gave a minimum score of 3 (5.6%) and a maximum score of 5 (72.2.6%), while the score of 4 was 22.2% with a mean and standard deviation of 4.67±0.59. During revalidation (stage 2 validation), the minimum score (3) was not found (0%), while the score of 4 decreased to 5.6%, and the maximum score (5) increased to 94.4%. In addition, rater 5's revalidation also found a mean and standard deviation of 4.94±0.24 with a gain of 0.28 (28%) (see Figure 2).

The results of content validity proved that all items scored >0.80 (5 raters with 5 rating categories), which is 0.80-1.00, so it met Aiken's testing parameters. The details are Aiken value 0.80 of 16.7%, Aiken value 0.85 of 16.7%, Aiken value 0.95 of 38.9%, and Aiken value 1.00 of 27.8%. Although it has met Aiken's validity parameters, researchers consider several essential notes from the rater committee to make revisions to specific items so that the scale developed can genuinely measure students' proactive decision-making skills. The details of the revalidation results are the value of 0.80 by 22.2%, 0.95 by 22.2%, and 1.00 by 55.6% (see Table 3).

The Cronbach alpha stage 1 reliability testing results prove that the value is 0.578, included in the poor category (<0.6). Furthermore, poor results were also seen in the inter-rater reliability test, where the Pearson's ICC test results proved a single measure of 0.215, so it was included in the poor category (<0.50). Looking at the results of content validity and reliability testing and notes from the rater committee, the researcher revised the items and conducted

revalidation (stage 2). As a result, the reliability value was 0.846, so was categorized as excellent (0.8 to <0.9) [41]. Meanwhile, the inter-rater reliability value is 0.524, included in the moderate category (0.50-0.75) [38]. Thus, all items developed met the content validity and reliability parameters on single and average measures (see Table 4). The ANOVA test results also proved that there were no significant differences among the rater committees on the SPDMS-18 assessment, both in stage 1 (validation) (0.520> 0.05) and stage 2 (revalidation) testing (0.063> 0.05).

Table 3. Aiken validity

SPDMS-18	Original version			Revision version		
	M±SD	Aiken-V	Decision	M±SD	Aiken-V	Decision
Item 1	4.2±0.4	0.80	Valid	4.2±0.4	0.80	Valid
Item 2	4.4±0.5	0.85	Valid	4.2±0.4	0.80	Valid
Item 3	4.8±0.4	0.95	Valid	5.0±0.0	1.00	Valid
Item 4	5.0±0.0	1.00	Valid	5.0±0.0	1.00	Valid
Item 5	4.8±0.4	0.95	Valid	5.0±0.0	1.00	Valid
Item 6	4.2±0.4	0.80	Valid	4.2±0.4	0.80	Valid
Item 7	5.0±0.0	1.00	Valid	5.0±0.0	1.00	Valid
Item 8	4.8±0.4	0.95	Valid	5.0±0.0	1.00	Valid
Item 9	4.8±0.4	0.95	Valid	4.8±0.4	0.95	Valid
Item 10	4.4±0.5	0.85	Valid	4.8±0.4	0.95	Valid
Item 11	4.8±0.4	0.95	Valid	5.0±0.0	1.00	Valid
Item 12	4.2±0.4	0.80	Valid	4.2±0.4	0.80	Valid
Item 13	4.8±0.4	0.95	Valid	5.0±0.0	1.00	Valid
Item 14	4.4±0.9	0.85	Valid	4.8±0.4	0.95	Valid
Item 15	4.8±0.4	0.95	Valid	4.8±0.4	0.95	Valid
Item 16	5.0±0.0	1.00	Valid	5.0±0.0	1.00	Valid
Item 17	5.0±0.0	1.00	Valid	5.0±0.0	1.00	Valid
Item 18	5.0±0.0	1.00	Valid	5.0±0.0	1.00	Valid

Table 4. Pearson's intraclass correlation coefficient

	Intraclass correlation[b]		F test with true value 0			
			Value		Sig.	
	Validation	Revalidation	Validation	Revalidation	Validation	Revalidation
Single measures	0.215[a]	0.524[a]	2.370	6.514	0.006	<0.001
Average measures	0.578[c]	0.846[c]	2.370	6.514	0.006	<0.001

Two-way mixed effects model where people effects are random and measures effects are fixed.

a. The estimator is the same, whether the interaction effect is present or not.

b. Type C intraclass correlation coefficients using a consistency definition. The between-measure variance is excluded from the denominator variance.

c. This estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise.

The various rater notes at the validation and revalidation stages are as follows. Item 1, two raters gave notes to clarify the word comprehensive. For example, EEM (female/42 years old) noted, "*For comprehensive, additional explanation is needed.*" Another rater, AHBH (female/35 years old), also suggested the same thing: "*The term comprehensive must be confirmed to the subject whether they understand.*" In Item 3, two raters gave notes. First, AM (male/64 years old) noted, "*The word against should be replaced with about.*" Meanwhile, AHBH (female/35 years old) noted, "*What kind of reflective decision should be explained.*" In item 4, EEM (female/42 years old) questioned the word various, which she thought caused multiple interpretations, as in her note below: "*Various is the quantity; is it more than one or more than 2.*" In item 5, AM (male/64 years old) recommended that the word "*I*" *be removed as in the following note:* "*The word I may also be better if removed. Maybe it could be: Carefully finding ways to achieve the set goals.*"

Still, the same rater, AM (male/64 years old), again noted the item: "*What if it is formulated like this: Trying to find new alternatives if the alternatives that have been chosen have not succeeded in achieving the predetermined goals.*" Not only that, EEM (female/42 years old) also suggested deleting the word "various," as in her note below: "*Trying to find other alternatives (because the various quantity must be clear)*." Item 8, AM (male/64 years old) suggested that the word "assess" be replaced with the word "scrutinize," as stated in the following statement: "*The word assess may be considered to be replaced with the word scrutinize,*" so that before making a decision, individuals need to pay close, careful, interested and earnest attention to the information they read. In item 10, AM (male/64 years old), "*It can be formulated like this: Thinking about when to make the right decision according to the situation and conditions.*"

Continuing item 12, AM (male/64 years old) completed the item formulation with the following recommendation: "*How about this: Use critical and analytical thinking processes in every decision made.*" Still on item 12, another rater, DAJJ (female/45 years old), questioned each item formulation maintaining a single trait, as in the following note: "*We recommend that in one item or item there should not be analytical and critical, choose one or make two items.*" Continuing with item 14, AM (male/64 years old) recommended that the formulation be revised to "*Renew the chosen solution if it has not succeeded in achieving the set goals.*" the last, AM (male/64 years old) again gave a note on item 16*:* "*Initiative to ask peers and/or lecturers if you encounter problems in trying to achieve the goal.*" (see Table 5).

Table 5. Students proactive decision-making scale

No	This course trains me ...	
	Original version	Revision version
1	Identifying comprehensive goals to improve academic performance	Identifying comprehensive (broad, thorough, meticulous) goals to improve academic performance
2	Making decisions that align with the established goals	Making decisions that align with the established goals
3	Making reflective and systematic decisions about what needs to be achieved	Making systematic decisions about what needs to be achieved
4	Identifying various alternative solutions to accelerate goal achievement	Identifying solutions to accelerate goal achievement
5	Carefully finding ways to reach my goals	Carefully finding ways to reach the goal
6	Trying different alternatives if the previous ones have not succeeded in achieving my goals	Trying to find new alternatives if the chosen alternatives have not succeeded in achieving the set goals
7	Proactively seeking relevant information before making decisions	Proactively seeking relevant information before making decisions
8	Evaluating the information that has been read and studied before making decisions	Paying attention to the information that has been read before making decisions
9	Verifying the facts and accuracy of information before making decisions	Verifying the accuracy of information before making decisions.
10	Considering when to make the right decision based on the conditions	Thinking about when to make the right decision based on the situation and condition
11	Considering career development in my current decision-making	Considering future career development in current decision-making
12	Using analytical and critical thinking processes in every decision made	Using critical thinking processes in every decision made
13	Increasing initiative to anticipate problems in achieving goals	Increasing initiative to anticipate problems in achieving goals
14	Changing previous solutions if they have not succeeded in achieving the goal	Updating solutions that have been chosen if they have not succeeded in achieving the set goals
15	Taking the initiative to ask colleagues and/or lecturers when encountering problems in achieving goals	Taking the initiative to ask colleagues and/or lecturers when encountering problems while striving to achieve goals
16	Learning new ways to improve academic performance	Learning new ways to improve academic performance
17	Doing the best methods to improve academic performance	Doing the best methods to enhance academic performance
18	Proactively improving current academic performance to make it even better	Proactively improving current academic performance to make it better

3-1-2- Construct Validity and Reliability

After successfully passing the content validity and reliability test, the researcher conducted an SPDMS-18 scale trial on 849 students to test the construct validity and reliability using the Covariance Based-Structural Equation Model (CB-SEM) analysis. According to Dash & Paul [48], of the two SEM analysis models (PLS and CB), CB-SEM is more fit than PLS-SEM in providing a factor-based model fit index when observing a large data set. Furthermore, CB-SEM is used to confirm the theory by determining how closely the proposed theoretical model can reproduce the covariance matrix for the observed sample data set [49]; CB-SEM can also be used to estimate models containing composites [50].

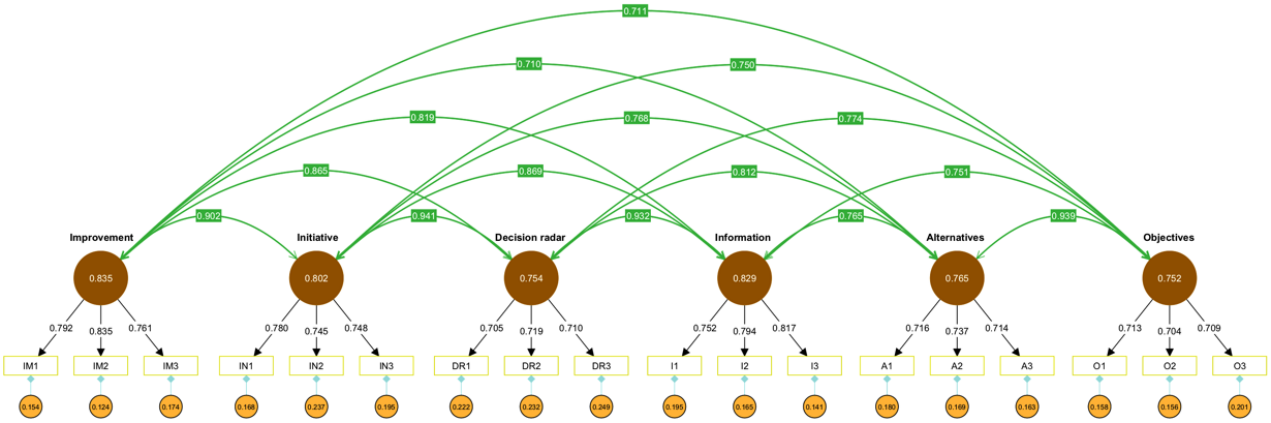

Figure 3. Path diagram (SPDMS-18)

The results of the CB-SEM analysis confirmed that 18 SPDMS items successfully met the loading factor parameters >0.70 (0.704-0.835) [42-44] (see Figure 3), Cronbach alpha reliability parameters >0.70 (0.752-0.835) and composite reliability parameters >0.70 (0.751-0.839) [41, 45], and Average Variance Extracted parameters >0.50 (0.502-0.634) [45]. The Fornell-Larcker discriminant validity testing parameters have also been met with a value range of 0.709-0.797 [45, 46] (see Table 6). In conclusion, each manifest variable in the SPDMS-18 construction can produce its latent variable covariance matrix so that the items developed can represent the actual situation.

Table 6. Construct validity and reliability

Indicator	Cronbach alpha	Composite reliability	Average variance extracted	Discriminant validity
Objectives	0.752	0.751	0.502	0.709
Alternatives	0.765	0.766	0.522	0.723
Information	0.829	0.831	0.621	0.788
Decision radar	0.754	0.755	0.506	0.712
Initiative	0.802	0.801	0.574	0.758
Improvement	0.835	0.839	0.634	0.797

3-1-3- Goodness of Fit Test (GoF)

The purpose of GoF testing is to assess whether the hypothesized model adequately describes the outcome experience (multivariate structure) observed in the variable data [51, 52]. The GoF testing output confirmed the Chi-Square/df value = 3.002 (<3.00), Root Mean Square Error of Approximation value = 0.049 (<0.08), Square Residual Mean Root value = 0.027 (<0.10), Normed Fit Index value = 0.958 (>0.90), Tucker-Lewis Index value = 0.963 (>0.90), and Comparative Fit Index value = 0.971 (>0.90) (see Table 7). Thus, the SPDMS-18 structural model meets the GoF testing parameters [41, 45, 47]. It means that the items constructed in the SPDMS-18 have a psychometric function that is fit to measure the actual condition, or the projected model has a high actual value when applied.

Table 7. Goodness of fit evaluation

	Estimated model	Null model
Chi Square/df	3.002 ≤3.00	55.445
Root Mean Square Error of Approximation (RMSEA)	0.049 <0.08	0.253
Square Residual Mean Root (SRMR)	0.027 <0.10	n/a
Normed Fit Index (NFI)	0.958> 0.90	n/a
Tucker-Lewis Index (TLI)	0.963> 0.90	n/a
Comparative Fit Index (CFI)	0.971> 0.90	n/a

3-1-4- Spearman's Correlation Test (Concurrent Validity)

Concurrent validity testing of the SPDMS-18 was also conducted to complement previous content and construct validity testing. According to Adams et al. [53], concurrent validity indicates agreement between two different assessments where a researcher wants to test a newly constructed scale with an established previous scale. In concurrent validity testing, researchers look for correlations between tests and relevant criteria [54, 55] to prove how well a measure correlates with other measures (other references) set at the same measurement point [56] or using two measurements taken simultaneously [57].

Considering the concept of concurrent validity above, this study correlated the SPDMS-18 with the Melbourne Decision-Making Questionnaire (Melbourne DMQ) developed by Mann et al. [35]. Before conducting the test, researchers tested the normality of the data using the Kolmogorov-Smirnov formula and the linearity test using ANOVA. The result shows that the data is not normally distributed (sig. = <0.001 <0.05), and the data is also not significantly linearly related between SPDMS-18 and Melbourne DMQ (sig. = <0.001 <0.05). Hence, the correlation test used is nonparametric statistics (Spearman correlation). For correlation testing, the respondent data on the buck-passing, procrastination, and hypervigilance indicators are assessed in reverse, while the vigilance indicator data is calculated typically.

The Spearman test results prove that the total correlation value is 0.359 (sig. = <0.001) (see Table 8), so we conclude that the concurrent validity of the newly developed scale is met. However, it is categorized as a weak correlation (0.10-0.39) [58, 59] with the Melbourne DMQ. The SPDMS-18 indicators correlate significantly with two Melbourne DMQ indicators: vigilance and procrastination. In contrast, the buck-passing and hypervigilance indicators have several indicators that are not significantly correlated. Thus, the SPDMS-18 can predict the handling of destructive behavior in students when making decisions, such as ignoring responsibility to people, not delaying decisions, or making decisions impulsively in a hurry without considering the consequences.

Table 8. Concurrent validity (intercorrelation SPDMS-18 with Melbourne DMQ)

SPDMS-18	Melbourne DMQ				
	Vigilance	Buck-passing	Procrastination	Hypervigilance	Total
Objectives	0.572**	0.122**	0.206**	0.062	0.366**
Alternatives	0.597**	0.044	0.119**	0.013	0.294**
Information	0.587**	0.106**	0.216**	0.021	0.349**
Decision radar	0.591**	0.076*	0.125**	0.035	0.314**
Initiative	0.602**	0.069*	0.138**	0.070*	0.330**
Improvement	0.564**	0.045	0.133**	0.000	0.281**
Total	**0.692****	**0.075***	**0.169****	**0.015**	**0.359****

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

3-2- Discussion

The main objective of this study is to innovate SPDMS-18 so that the results of this study have successfully reported 18 scale innovation items have successfully passed the verification of the Aiken validity test (0.80-1.00) and content reliability (single measure = 0.524; average measure = 0.846). The validity and reliability test of the construct also reported positive results, namely the loading factor value CFA = 0.709-0.874, Cronbach alpha value = 0.752-0.835, composite reliability value = 0.751-0.839, AVE value = 0.502-0.634, and discriminant validity value = 0.709-0.797. Meanwhile, the results of the GoF test prove that SPDMS-18 is also fit, where the Chi-Square/df value = 3.002, RMSEA = 0.049, SRMR = 0.027, NFI = 0.958, TLI = 0.963, and CFI = 0.971. Therefore, SPDMS-18 correlates significantly with Melbourne DMQ with a significance value in the concurrent validity test = <0.001. The results of this study extend the usefulness of PDM, which Siebert & Kunz [6] previously developed so that it can be used to evaluate students' proactive decision-making towards their academic performance. Although expanded, this study uses a loading factor criterion of >0.70, which in the previous study by Siebert & Kunz [6] was still found in the initiative indicator (INI 3 and INI 5 items formulations).

As one of the components of life skills [60-62], decision-making needs to be intentionally integrated into the learning experience of university students. Their learning experience should encourage them to rationalize active decisions regarding their future as competent prospective teacher students. They should not be reactive when receiving assignment responses from lecturers to complete specific work, let alone spend time on unproductive activities. Students can start by deciding to complete their studies on time, gaining additional skills to support their academic performance, taking academic writing and scientific publication training, becoming competent teachers, and so on. This proactive attitude underlines that the proactive decision-making model not only guides students actively to create their future (including academic performance and post-study career) through selected actions, but they also make reflective and systematic decisions about what they want to achieve, identify various alternative solutions to accelerate the achievement of goals, and try various alternatives if the previous alternative has not succeeded in achieving the goal. For example, they analyze the graduation requirements and evaluate alternatives carefully and periodically for the success of their trials.

As reported in the concurrent validity test (see Table 8), SPDMS-18 has conducted statistical tests to see its correlation with vigilance, buck-passing, procrastination, and hypervigilance behavior. This scale reports whether students with good proactive decision-making can help them overcome buck-passing, procrastination, and hypervigilance, which is essential for improving academic performance and student career planning. Thus, when they are involved in lectures, students with good proactive decision-making do not shift responsibility by giving decision-making for developing their competence and career to others. Observing the significant correlation results, they do not delay decisions to improve their academic performance and career by putting forward irrational arguments for their apathy due to high stress due to poor proactive planning. Alternatively, students can decide to find a way out of a dilemma by panicking due to time pressure and impulsive decision-making in a hurry [35].

Students Proactive Decision-Making Scale-18 also uses proactive cognitive skills [6] that implicitly help someone when making decisions based on value-based thinking, which is self-initiative and seeks to improve decisions [63] that can affect the individual's planned happenstance in making career decisions [64, 65]. For example, at the end of high school, adolescents must face critical decisions that change their future by determining what to do after graduation. Adolescents must be able to make good decisions in this dilemma, so they must be given proactive decision-making training since adolescence [66, 67]. Suppose adolescents have an excellent proactive decision-making attitude when they become university students. In that case, they can identify comprehensive goals to improve their academic performance, make decisions based on the goals set, or make systematic decisions about what they want to achieve. Thus, students can not only control academic procrastination but also avoid it because all their activities are well-scheduled and always predictive of current progress.

If we look closely at the study report of Zhou et al. [68]. We can see that even postgraduate students need help making career decisions due to their poor professional identity and proactive personality. The solution that Melović et al. [69] offer is that students need career planning skills and proactive behavior. This problem can be supplemented with Siebert and Kunz's indicators [6], which are used to formulate SPDMS-18. For example, in the systematic identification of objectives indicator, students must have goals when they are studying so that these goals become their focus for systematically creating alternatives, guiding methodical information searches, and decision planning. Other indicators, such as systematic identification of alternatives, help students identify alternatives to increase the likelihood that students will achieve their goals so that they proactively identify solutions to accelerate the achievement of goals, carefully find ways to achieve goals or try to find new alternatives if the alternatives that have been chosen have not succeeded in achieving the goals that have been set.

Proactive students make decisions about the future for good career adaptability [70]. They seek information to help them evaluate alternatives to achieve goals, frame their decisions strategically, consider other decisions, be proactive, and are interested in making a meaningful impact by seeking improvement in decision-making situations [6]. Operationally, students make plans before working, determine work priorities, and are responsible for time and work priorities [71]. They are more selective in using the clarity of information in the lecturer's learning design to be on time when completing work. Minimizing their learning problems or obstacles by learning and acting according to the assessment rubric, committing to every task and responsibility of the lecture, selecting feedback to improve academic performance, and taking the initiative and autonomy to develop learning strategies according to the goals set [72]. Furthermore, students also use proactive decisions to prepare themselves to become professional teachers, so they prepare knowledge and skills that affirm their competencies as lifelong learners. They become concerned about their future by starting to plan and establish strategic actions.

The results of the SPDMS-18 innovation are the only instruments that lecturers can use at universities to measure, assess, and evaluate students so that they are proactive in making decisions about their career development (such as their academic performance and others). Instead of students reacting to stimulation, they should be encouraged to proactively determine their future because a person's future is also determined by their current decisions [8], and determining a straightforward future job is one of the influential factors in the success of student studies [73]. Students are more selective in diagnosing various information or data and activities relevant to their future goals (values and preferences) [9]. In this process, students can make effective decisions during the alternative generation phase [26]. Ultimately, students must know what they want in the future, what actions they must take to achieve it, and how they prepare themselves to overcome various obstacles to achieve these goals.

Practically, lecturers and/or students can use SPDMS-18 before and after the end of the lecture using various supporting tools, such as Google Forms and so on. This method benefits lecturers and/or students because the learning design they organize can impact the development of students' proactive decision-making. In addition, it can also be studied how the effectiveness and efficiency of students with high and low proactive decision-making skills are on the success and improvement of their academic performance. In longitudinal studies, their impact on the development of students' careers after the study is examined. Referring to the study results with a population of students in the "sport science" science group, future studies can consider the theory and indicators of proactive decision-making to be transferred and tested in different population contexts (countries, disciplines, and levels of education). It is important to provide attention and literacy to various education actors so that they begin to care and be proactive about decisions that support their vision and future so that they can use their minds, psychology, energy, and time productively.

4- Conclusion

Receptive and reactive attitudes towards work also stimulate the problem of academic performance and career development of students. They become unvisionary towards their future self-portrait, resulting in them needing to be more active in making decisions about what they want to achieve. This study successfully constructed the SPDMS-18 to help lecturers and students be more concerned and proactive about the future of students so that: (1) guide them systematically when selecting information methodically, (2) identify alternatives to increase the possibility of students achieving their goals, (3) proactively and directed in seeking information that will help them evaluate alternatives in terms of achieving relevant values), (4) frame their decisions strategically, consider other decisions, proactively, and in a future-oriented manner, (5) proactively take the initiative in decision-making situations, and (6) create meaningful impact by striving for improvement in decision-making situations.

This scale has passed four stages of validity and reliability testing, from Aiken content validity testing (0.80-1.00), single measure reliability = 0.524, and average measure reliability = 0.846. Construct validity testing with loading factor = 0.709-0.835, Cronbach alpha = 0.752-0.835, composite reliability = 0.751-0.839, AVE = 0.502-0.634, and discriminant validity = 0.709-0.797. The GoF model test proves that the Chi-Square/df value = 3.002, RMSEA value = 0.049, SRMR value = 0.027, NFI value = 0.958, TLI value = 0.963, and CFI value = 0.971. The final test, concurrent validity using Spearman correlation with Melbourne DMQ, confirmed the sig. = <0.001. In conclusion, SPDMS-18 has a significant psychometric function with the actual situation. It becomes a credible reference for lecturers to measure, assess, and evaluate students' proactive decision-making to determine their future vision proactively. At the same time, the vision navigates them to make critical, systematic, and measurable decisions in each of their selected activities.

5- Declarations

5-1- Author Contributions

Conceptualization, J.B. and M.; methodology, J.B. and S.; software, J.B., M., and T.S.; validation, J.B., M., and S.; formal analysis, S. and T.S.; investigation, J.B. and M.; resources, J.B., M., and M.; data curation, J.B., M., and S.; writing—original draft preparation, J.B.; writing—review and editing, J.B. and M.; visualization, M., S., and T.S.; supervision, J.B.; project administration, J.B., M., and M.; funding acquisition, M., M., S., and T.S. All authors have read and agreed to the published version of the manuscript.

5-2- Data Availability Statement

The data presented in this study are available on request from the corresponding author.

5-3- Funding and Acknowledgements

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5-4- Institutional Review Board Statement

The study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Review Board (or Ethics Committee) of the Universitas Kristen Artha Wacana (118/LEMLIT-UKAW/P.10/X.2024).

5-5- Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

5-6- Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely observed by the authors.

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Appendix I: Students Proactive Decision-Making Scale (SPDMS-18)

No	This course trains me ...	Response				
		D	SA	QA	A	SA
1	Identifying comprehensive (broad, thorough, meticulous) goals to improve academic performance					
2	Making decisions that align with the established goals					
3	Making systematic decisions about what needs to be achieved					
4	Identifying solutions to accelerate goal achievement					
5	Carefully finding ways to reach the goal					
6	Trying to find new alternatives if the chosen alternatives have not succeeded in achieving the set goals					
7	Proactively seeking relevant information before making decisions					
8	Paying attention to the information that has been read before making decisions					
9	Verifying the accuracy of information before making decisions					
10	Thinking about when to make the right decision based on the situation and condition					
11	Considering future career development in current decision-making					
12	Using critical thinking processes in every decision made					
13	Increasing initiative to anticipate problems in achieving goals					
14	Updating solutions that have been chosen if they have not succeeded in achieving the set goals					
15	Taking the initiative to ask colleagues and/or lecturers when encountering problems while striving to achieve goals					
16	Learning new ways to improve academic performance					
17	Doing the best methods to enhance academic performance					
18	Proactively improving current academic performance to make it better					

Note: D = Disagree, SA = Somewhat agree, QA = Quite agree, A = Agree, SA = Strongly agree.