

Understand the construct of formative assessment and its role between diagnostic and summative: High school entrepreneurship subjects

Azira Prawinugraha*; Sri Yuliawati; Sugiarto

Universitas Muhammadiyah PROF.DR. HAMKA, Jakarta, Indonesia

*Corresponding Author. E-mail: Aziraprawinugraha@gmail.com

ARTICLE INFO

Article History

Submitted:

19 August 2024

Revised:

19 December 2024

Accepted:

30 December 2024

Keywords

formative assessment;
entrepreneurship subjects;
transformative design;
psychometric construct,
high school

Scan Me:



ABSTRACT

This study aims to understand the formative assessment construct for high school entrepreneurship subjects, as well as examine the relationship between diagnostic and summative. Mixed research methods transformative design approach. The first framework is mixed methodology: convergent parallel design combines qualitative interactive model analysis (IMA) techniques and quantitative exploratory factor analysis (EFA) techniques. The second framework is quantitative confirmatory factor analysis (CFA) techniques. The research location was in a cluster of senior high schools in Bintan district. The IMA sample consists of 5 high school entrepreneurship teachers recruited through purposive sampling, while for the EFA and CFA, 259 students were recruited randomly. IMA analyze the understanding and factors involved by teachers in carrying out formative assessments as an important element of learning progress, EFA explores the initial composition of formative assessment constructs, and CFA acts as a lens (affirmation) that evaluates the outer model. EFA forms a fit model. The final interpretation explains that the construct of formative assessment in entrepreneurship subjects has the nature of complementarity, an inner model that moves circularly, repeated interactions produce learning progress, and strengthens the basis of the centrality of formative between diagnostic and summative

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To cite this article (in APA style):

Prawinugraha, A., Yuliawati, S., & Sugiarto. (2024). Understand the construct of formative assessment and its role between diagnostic and summative: High school entrepreneurship subject. *Jurnal Penelitian dan Evaluasi Pendidikan*, 28(2), 255-275 doi: <https://doi.org/10.21831/pep.v28i2.77143>

INTRODUCTION

The existence of Small and medium enterprises (SMEs) in advancing the country's economy has been recognized (Brem & Radziwon, 2017; Sledge, 2012; Stam, 2015). However, a number of challenges for SMEs include the complexity of entrepreneurial problems that continue to grow along with the tight business competition in the contemporary world. For example, it is clear that SME activities have been supported by the government and will have an easy impact on their actualization, but various demands, such as how SMEs are able to survive to make their businesses successful, successfully realize ideas and creativity, effective promotions that are spread are also present. Thus, the critical momentum (demands, business uncertainty) for SME actors still occurs until the discussion of how they survive amid uncertainty and prioritize entrepreneurial values continues to be carried out in the literature of the last decade (Baron et al., 2016; Block et al., 2017). Referring to the study of Baron, Franklin, & Hmieleski (2016), the efforts of actors SMEs to launch and develop new businesses are faced with a series of potential stressors that are frightening work environments, often unpredictable - changing rapidly, facing high levels of risk, very heavy workloads, responsible for the company and its employees, and they often operate in very limited financial conditions. Given the severity of uncertainty experienced by entrepreneurs, the concerns of entrepreneurs who decide to leave

entrepreneurial activities (even in the first year of running a business), and the loss of opportunities for the availability of new jobs.

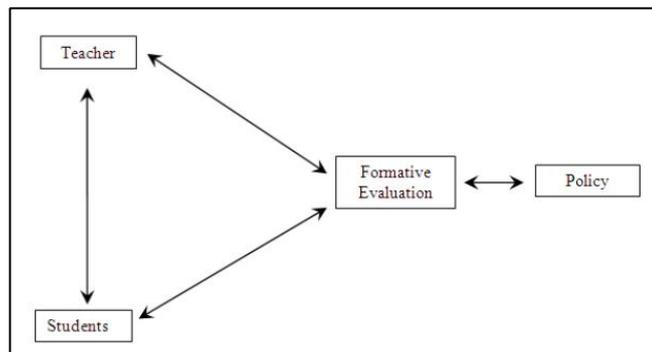
In order to overcome the conflict of SME's decline, the practice of procedures and theoretical learning presentations of entrepreneurship seems important to be intensified at a lower scale. For example, entrepreneurial practices and theories can be taught and are relevant to be used as local subjects for high school students (Sasongko, 2017). How are entrepreneurial theories and practices in a specific entity, namely high schools, actualized in entrepreneurship subject education? Entrepreneurship education is a structured effort by schools to compile an entrepreneurship learning curriculum that is taught to students so that students' knowledge, spirit, will, and intensity of entrepreneurial behaviour can be realized through creative, innovative, productive activities and courageous actions in facing risks. Entrepreneurship education gets a portion as a subject that must be taken by students (Kemendikbud, 2013; Rusdiana, 2017). Schools are given the authority to develop these subjects according to environmental conditions, resources, community expectations, and future economic prospects (Efendi et al., 2018; Marsaoli & Kusumasari, 2022; Sasongko, 2017). The phenomenon and implications of the practice of entrepreneurship subject education are attached to national literature studies. The search for a combination of keywords economics and entrepreneurship education on the SINTA Journal Engine page recorded 61 journals in 2023-2024. In terms of quantity, the theory, practice, and teaching of entrepreneurship subjects have been fulfilled and have begun to be considered very carefully by researchers.

We noted significant literature in recent years revealing this interaction, such as trying to understand the micro, meso and macro ecosystems of education, creating a framework for creativity in entrepreneurship education, mindsets and the role of the study environment, and the implications of entrepreneurship education for future jobs (Bujor & Avasilcai, 2016; Chienwattanasook & Jermisittiparsert, 2019; Fulmer et al., 2015; Jabeen et al., 2017). Another note is that it is important for academics to realize that assessment activities are actually included in all proportional criteria of this interaction. The strongest literature in marking assessment is the heart of the success of entrepreneurship education, such as Pittaway & Edwards (2012) and Rasmussen (2016), where educators experience challenges in how to assess core skills and competencies of Innovation and entrepreneur Education (I&E) (e.g., creativity, innovation, and prototyping), but have a significant impact on all layers of I&E implementation, how the success of entrepreneurship education in school entities is dominated by the implementation of formative assessments that have continued to be developed over several decades because this type of assessment is relevant to education and/or entrepreneurship subjects that emphasize the learning process of students rather than the final results.

Entrepreneurship education assessment seems strong on an international scale, but reflecting this on the Indonesian entrepreneurship education ecosystem is a challenge. When discussing the practice of entrepreneurship education plainly, the instructions for its effectiveness seem fragmented. The entrepreneurship education curriculum guidelines that are actualized in the high school curriculum actually change continuously, such as the 2006 KTSP curriculum where entrepreneurship is only a local content subject (or not even referred to as entrepreneurship in its identity), referred to as an entrepreneurship subject in the 2013 curriculum (see the high school entrepreneurship learning module (Kemendikbud, 2013)), the formulation began to be comprehensive in the revised 2013 curriculum with the name of the Entrepreneurship Craft subject (Kemendikbud, 2019), and less than 10 years later this term was changed again to Produk Kreatif Kewirausahaan (Creative Products and Entrepreneurship) (PKK) in the Merdeka Belajar curriculum (Kemendikbud, 2020). The researcher's intuition about this policy seems to give rise to abstract thoughts; for example, does the intense revision of the context of school entrepreneurship education (especially in a tight time) have implications for accelerating the quality of student entrepreneurship? This seems unclear and contradictory

when looking at the urgent situation of the country whose unemployment rate continues to grow. Of course, this curriculum revision activity is a confusing implementation for the entire school academic community, especially entrepreneurship teachers. The practice of formative assessment of entrepreneurship education does not have a strong foundation, such as whether teachers should assess creativity. Product innovation? Independence and resilience of entrepreneurial individuals? Or the functional value of products created by students.

Entrepreneurship education experts believe that entrepreneurship learning activities can be accelerated if the assessment formation formed is strong enough to examine the progress of teaching and learning activities (Pittaway & Edwards, 2012). The heart of the success of entrepreneurship education lies in formative assessment, namely the assessment of students' daily lives (Rasmussen, 2016). Formative is considered appropriate to be strengthened because it is relevant to the meaning of entrepreneurship itself, which emphasizes the process and not the results.



Source: [Dunn & Mulvenon \(2009\)](#)

Figure 1. Key Model for Academic Success.

The results of the analysis of Figure 1 mean that formative evaluation is a relational and dynamic relationship such as argumentation (Buck et al., 2010; Clark, 2010), where the fibre of formative assessment formation is actualized and influenced in two directions between teachers and students. Therefore, formative assessment is actually not only formed in a standard way by teachers, but students also play a role in formulating formative assessment where students reflect on formative assessment (in academic activities), then resonate with the representative values to be assessed, suitable for the classroom environment, and the formative assessment rubric is a joint decision (between teachers and students).

The actualization process of formative assessment for entrepreneurship subjects is difficult to detect because human attributes (affective, cognitive, and psychomotor) are integrated with real entrepreneurial actions that blend knowledge, experience, and direct practice. Several pieces of literature from the last decade examine how formative assessment is formulated and executed by educators. Rasmussen (2016) explains the diversity of assessments from the perspective of educators can provide a complete picture of how the process of innovation and entrepreneurship education can be carried out, which is actually a strong implication of the appropriate assessment performance. Prawinugraha, Latief, and Sugiono (2021) explained that the assessment of entrepreneurship learning must be authentic (authentic assessment) to assess student readiness as a whole, referring to Graduate Competency Standards, process assessment, as well as seeing directly the results of student work. Pittaway and Edwards (2012) found strong evidence that various forms of using assessment in different ways certainly have implications for the success of the actualization of entrepreneurship education. Cagayan, Care, Robertson, and Luo (2020) explain that creating a formative

assessment protocol through classroom observation, equipped with formative assessment tools provided in the formative assessment data collection facility, can increase the capacity of the student's formative assessment criteria level. Welsh & Tullar (2014) show a cross-campus entrepreneurship assessment model that is based on the construct proposed by the researcher (Change, Risk-taking Goal setting, Feedback, Achievement Responsibility, Success motivation, Intention and Fate control) successfully assesses students objectively from the proposed assessment construction criteria. The increase in entrepreneurship value was detected in the difference in the pre and post-test of the cross-campus entrepreneurship assessment. All of them strengthen the basis of the centrality of formative assessment as the progress of student learning. However, limitations are still detected, such as not all previous articles being able to answer how the construct of formative assessment is formed in two directions (between teachers and students).

The construction of the formative assessment factors studied hasn't been designed, or even theoretically, the diagram and manifestation of the formative assessment itself is quite rare. Therefore, this study will start from the basis of how these factors allow for deeper exploration in high school units. Related to the importance of multi-level interactions in entrepreneurship education and the urgency of assessment as a relevant measuring tool, this study aims to find out how formative assessment is formed, how it is implemented, explore teachers' perspectives: "What kind of assessment do they consider appropriate", and visualize the role of formative between diagnostic and summative. We have access to the cluster of high schools in Kabupaten Bintan (regency) and Provinsi Kepulauan Riau (province in Indonesia). The object of study of several high schools in Bintan Regency is to see how the formative assessment of subjects is actualized naturally, and its construct can be measured.

RESEARCH METHOD

Mix Methodology: Transformative Design

Combining qualitative and quantitative methods in the same study is an important approach to consider so that data can be confirmed widely, validly and highly reliably (Guest & Fleming, 2019). The mixed research design used is transformative, a mixed research model that uses one of the four mixed research models (convergent, explanatory, exploratory, embedded) designed using a transformative framework or lens; then in the data collection process, marginalized observation samples can be combined to collect data and then analyzed (Creswell et al., 2011). We propose the transformative design as follows at Figure 2.

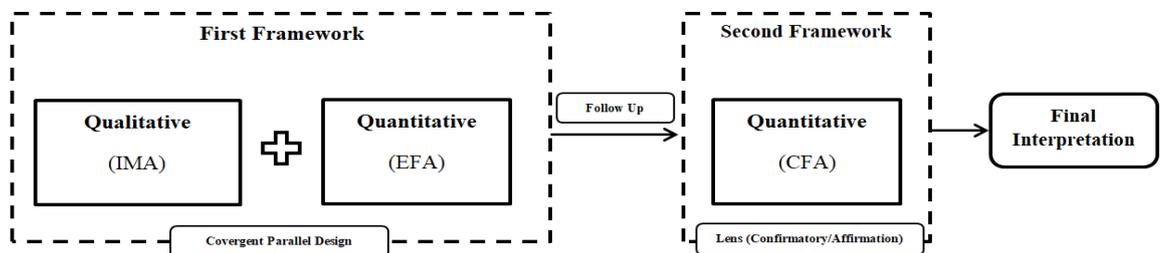


Figure 2. Mix Methodology: Transformative Design. Source: modified from Creswell (2011)

The first framework in the transformative design Mix Method begins with a qualitative research approach, Interactive Model analysis (IMA), and is combined with quantitative Exploratory Factor Analysis (EFA). The combination of the two methods (qualitative and quantitative) of the first framework is then referred to as convergent parallel design, where the

collection and analysis of two different but balanced data properties (descriptive and quantitative) can provide an overview of the general understanding, the emergence of latent factors, and the grouping of manifest factors of formative assessment of entrepreneurship subjects. Through the Confirmatory Factor Analysis (CFA) model in the second framework, confirmation is needed in order to find philosophical and theoretical similarities and find a fit model as a follow-up analysis process and lens (deepening understanding) of how the final interpretation of the formative assessment construct of entrepreneurship subjects.

Data Collection

Table 1. Information of Data Collection

No	Framework	Model	Sampling & Collection Type	Participant	Date
1.	First	Qualitative (IMA)	Purposive & Unstructure Interview	5 entrepreneurship subject teachers	March - August 2023
		Quantitative (EFA)	Random & Questionare	259 students	October 2023 - February 2024
2.	Second	Quantitative (CFA)	Random & Questionare	259 students	March – May 2024

In the IMA model (first framework), the general questions asked in the unstructured interview session to entrepreneurship teachers are; "What do you understand about formative assessment?", "What factors do you involve in formative assessment? So that you believe these factors are important elements for learning progress", and "Would you be willing to tell us (\pm 5-10 minutes) how you carry out formative assessment between diagnostic and summative?". Qualitative results will formulate the coding of formative assessment construct factors for entrepreneurship subjects by teachers, then the resulting factors will be formulated into a "formative assessment factor" questionnaire. The formative assessment factor questionnaire will be distributed to students, and the results of the questionnaire will be explored using the EFA technique (first framework) to create an initial composition of the formative assessment construct for entrepreneurship subjects. Finally, the evaluation of the outer model of the EFA results is continued in the CFA (second framework) (lens or affirmation) to form a fit model of the formative assessment construct for entrepreneurship subjects in high school.

Construct Measurement

Construct measurement is conducted by reviewing the interview transcriptions of all informants (entrepreneurship teachers), separating the concentrate of "sentence fragments" that can produce concepts, terms, expressions, and thematic results that are considered to represent formative assessment factors. This stage is called "first-cycle coding" (Miles et al., 2014). The construction of the formative assessment instrument is based on the first-cycle coding process that creates thematics about "factors involved in formative assessment". This work is considered appropriate because the general questions asked are about "factors involved" and "how to implement" so that all units can be formulated into questionnaire items to capture student responses (efficiently and comprehensively). After the articulation of the first-cycle coding unit of factors involved in formative assessment is complete, the questionnaire items of the formative assessment factor instrument begin to be formulated. We formulate questionnaire items that are in accordance with the conceptual definition, the fibre of the understanding of

formative assessment and the realm of entrepreneurship subjects. The aim is that the narrative of the questionnaire items presented can be understood by students, can be relied on to explore formative assessment factors and is in accordance with the entrepreneurship subject material.

Statistical Multivariate Analyze

Multivariate statistical tests were conducted on models EFA and CFA. The proposed multivariate statistical test is useful for processing qualitative follow-up data (IMA) from the first cycle coding results. The EFA multivariate statistical test is useful for exploring factors to form an initial factor composition that can be justified psychometrically, while CFA confirms and improves the EFA inner and outer models to form a fit model of formative assessment factors for entrepreneurship subjects. We used a data processing application called Jeffrey's Amazing Statistics Program (JASP 0.16.2.0) to examine the quantitative results (EFA and CFA). Details of the multivariate statistical assumption test between EFA and CFA are attached in the following Table 2.

Table 2. Multivariate Statistical Assumption Test EFA & CFA

No	Model	Multivariate Statistical Assumption Test	Parameter
1.	EFA	Kaiser Meyer Olkin (KMO) Test	0.9
		Barlett's Test of Sphericity	> Chi-square Test
		Eigen Value & Scree Plot	> 1
		Factor Loadings	0.35
		Factor Rotation	Oblique Varimax Method
		Interpretation of Factors	Psychometric justification
2.	CFA	Eigen Value & Scree Plot	> 1 (EFA review)
		Root Means Square Error of Approximation (RMSEA)	0.5 – 0.8
		Comparative Fit Index (CFI)	0.9
		Factor Loadings	> 0.6
		Factor Rotation	Elimination factor (<0.6)
		Interpretations of Factors	Theoretical hypothesis: H ₀ : Outer Model Non-Fit H _a : Outer Model Fit

FINDINGS AND DISCUSSION

Findings

Demographic Respondent

Qualitative data collection was conducted on entrepreneurship teachers, and then quantitative data on the target population of the researcher were students in grades 10, 11, and 12 of Bintan Regency Senior High Schools who had taught Entrepreneurship subjects. Several schools that were partners in carrying out this data collection were SMAN 1 Bintan Utara, SMAN 1 Teluk Bintan, SMAN 1 Teluk Sebong, SMAN 1 Toapaya, and SMAN 1 Bintan Timur. The total number of teachers is 5, with one male and four female, all holding a bachelor's degree. Meanwhile, the total number of students is 259, with 106 male and 153 female, consisting of 48 students in grade 10, 109 students in grade 11, and 102 students in grade 12.

Table 3. Demographic Respondent

Participant	Category	Frequency	Percentages
Entrepreneur teacher	Gender		
	Male	1	20%
	Female	4	80%
	Educational background		
Student	Diploma		
	Bachelor	5	100%
	Post graduate		
	Gender		
	Male	106	40.9%
	Female	153	59.07%
Class	10	48	18.53%
	11	109	42.08%
	12	102	39.38%

IMA (Teachers Understanding and Construct Measurement)

IMA first interview to analysis understanding of formative assessment by entrepreneurship teachers. Results are as follows at Table 4.

Table 4. Understanding Of Formative Assessment By Entrepreneurship Teachers

First-Cycle Coding	Unit Grouping	Thematization
- Light assessment	- Learning focus	Attention and Learning Focus
- Characteristics and development of students	- Willingness and attention to learning	(5 unit)
- Learning focus	- Attention and listening in learning	
- Daily formative notes	- Learning performance	
- Teacher's ability to assess	- Willingness to pay attention	
- Student's personal strengths	- Light assessment	Formative Rubric Formula
- Willingness and attention to learning	- Daily formative notes	(10 unit)
- Learning readiness	- Teacher's ability to assess	
- Attention and listening in learning	- Compliance in completing tasks	
- Compliance in completing tasks	- Fluctuating assessment	
- Fluctuating assessment	- Composition of formative rubric	
- Formative rubric composition	- Daily assessment	
- Daily assessment	- Expression of feelings	
- Learning performance	- Warnings and affirmations	
- Expression of feelings	- Expertise in assessing students' learning ability	
- Student responses	- Characteristics and development of students	Student Learning Readiness and Development
- Willingness to pay attention	- Student's personal strengths	(5 unit)
- Expertise in assessing student learning ability	- Learning readiness	
- Following the flow of learning	- Student responses	
✓ Learning progress	- Following the flow of learning	
✓ Understanding of material	✓ Learning progress	
✓ Attitude	✓ Understanding of material	
- Warnings and affirmations	✓ Attitude	

The recorded concepts in the understanding of formative assessment by the teacher consist of 3 (three) parts, namely: 1) attention and learning focus, 2) formative rubric formula,

and 3) student learning readiness and development. Attention and learning focus are formed based on 5 (five) thematic units, the formative rubric formula is formed based on 10 (10) thematic units, and student learning readiness and development are formed based on 5 (five) thematic units. The researcher considers the grouping of units and their quantity to be sufficiently balanced and capable of representing the concepts proposed in the understanding of formative assessment.

After we analysed the understanding of formative assessment, we continued the second interview to inquire about the factors considered to influence and how these factors are believed to contribute to the progress of the formative assessment. The factors formed and articulation are attached as follows Table 5.

Table 5. First Cycle Coding Factor & Articulation

No	First Cycle Coding Factor	Articulation
1	Honestly	Correctly complete assignments and do not attempt to cheat
2	Desire to Learn	Have a desire to follow the learning process
3	Independence	Confident in being able to carry out learning, do assignments, and exams
4	Politeness	Behave politely to teachers
5	Maturity	Can distinguish behavior (good/bad)
6	Respectfull Attitude	Can respect teachers as educators or friends as peers
7	Student Happiness	Feeling happy without pressure when learning
8	Smile	A smiling facial expression
9	Positive Perspective	Having a good view or assumption even when faced with problems
10	Learning Enthusiasm	Interest in wanting to pay attention and follow the learning process
11	Leadership	Applying leadership values (responsibility, authority, management)
12	Respecting Others	Not underestimating others (teachers and friends)
13	Willing to Sacrifice	Taking risks to realize common interests
14	Helping Each Others	Thinking and carrying out tasks together with colleagues when facing challenges
15	Personal Hygiene	Paying attention to personal hygiene
16	Keeping Promises	Fulfilling agreements that have been determined together
17	Humility	Behaving calmly, accepting difficulties, and continuing to learning when its difficult
18	Emotional Inteligence	Good at managing feelings
19	School Discipline Orientation	Focusing on regulations and disciplinary attitudes built by the school
20	Improvisation Assessment Diversity	Many alternatives offered by teachers when carrying out formative assessments
21	Teachers Subjectivly	Teachers' tendency to assess based on personal principles
22	Inteligent Quotient Equality	Balance of intelligence between students
23	Implications for Future Formative Assessment	Formative assessment affects students' attitudes in the future
24	Teacher Memory	Teachers' memories of high-achieving students
25	Teacher Creativity and Improvisation	Teachers' ability to change or create formative assessments at a learning momentum
26	Semi Paper Test	Non-formal written tests (without grades)
27	Short Verbal Quiz	Spontaneous question and answer sessions
28	Sensitivity of Learning Interest	Sensitivity in paying attention to intentions and desires to learn
29	Student Activeness	Responses and responses made quickly by students when learning
30	Seriousness of Learning	Focus on paying attention when learning
31	Student Courage	Have no hesitation to interact Q&A
32	Classroom Environment	Classroom conditions (quiet or noisy)
33	Reasoning Process	Striving to build fibers of thought to understand a material
34	Spiritual Quotient	Upholding religious values that are adhered to

No	First Cycle Coding Factor	Articulation
35	Student Cooperation	Carrying out joint tasks between individuals or all individuals
36	Neatness of Study Tables	Paying attention to the neatness of the table (seemly like tools: stationery, books, table position) when starting to study
37	Neatness of Student Notes	Paying attention to the neatness of notes when writing
38	Student Argumentation	Thinking of the best answer when wanting to express an opinion
39	Thinking Power	Ability to think systematically and superiorly
40	Pre-test Essay	Written test to assess initial abilities
41	Student Logic	Reasoning correctly based on factual review
42	Presentation Performance	Ability to convey opinions in public through charisma and knowledge
43	Student Motoric	Active student movement during learning
44	Memorization of Entrepreneurial Attitudes	Oral tests aimed at remembering entrepreneurial attitude theory
45	Multiple Choice Paper Test	Written tests that assess the accuracy of options (multiple choices task)
46	Paper Test Essay	Written tests that assess individual opinions
47	Oral Exam	Oral tests containing certain theory
48	Product Prototype Presentation	Ability to convey information about self-made product samples to the public
49	Entrepreneurial Success Motivation	Interest in the achievements or success of entrepreneurs
50	Time	Able to manage time resources
51	Final Prototype	Form of completed business product
52	Financial Management Knowledge	Has the ability and knowledge to manage personal and group financial resources
53	Product Creativity	Products that reflect differentiating power from other similar products
54	Processing Creativity	A number of new ideas for implementing product processing techniques that have differentiating power from other similar processing techniques
55	Product Uniqueness	Products have certain specific characteristics that other similar products
56	Product Function	Products have special uses to meet consumer needs
57	Marketability	Products meet the criteria for entering the market

EFA Test

Table 6. EFA Multivariate Statistical Assumption Test

Assumption Test	Result	Decision
Overall KMO test	0.929	Proportional (accepted)
Barlett's Test		
X^2	11025.537	Proportional (accepted)
df	1485.000	
p	<0.001	
Chi-Square	2720.342	
Eigen Value & Scree Plot		
Factor Rotated Solution	5	>1 Inflection point
SumSq. Loading	1.106	
Proportion var.	0.020	
Cummulative	0.535	

Table 6 show that the overall KMO test value was 0.929, and Barlett's test of sphericity $X^2 > \text{Chi-Square}$ value so that the researcher's observation data was declared proportional and feasible for exploratory factor analysis. Then, the results of the eigenvalue review and scree plot examination showed that the maximum factor that could be rotated was 5 factors. After the multivariate statistical assumption test was met, it continued with the EFA loading factor rotation which can be seen in Table 7.

Table 7 . EFA Rotation Result and Factor Loadings

Formative Assessment Factor	Factor 1	Factor 2	Factor 3	Uniqueness
Thinking Power	0.757			0.355
Paper Test Essay	0.754			0.404
Marketability	0.730			0.345
Oral Exam	0.725			0.354
Product Uniqueness	0.721			0.465
Product Function	0.701			0.485
Politeness	0.692			0.448
Multiple Choise Paper Test	0.676			0.434
Keeping Promises	0.637			0.464
Time		0.839		0.225
Reasoning Process		0.821		0.260
Spiritual Quotient		0.788		0.310
Helping Each Others		0.778		0.291
Leadership		0.754		0.377
Willing to Sacrifice		0.747		0.354
Prototype Final		0.735		0.427
Smile			0.795	0.354
Class Environment			0.764	0.405
Short Verbal Quizz			0.695	0.514
Sensitivity of Learning Interest			0.682	0.487
Implications for Future Formative Assessment			0.681	0.519
Student Happines			0.672	0.500
Teacher Memory			0.657	0.525
Student Courage			0.600	0.574
Improvisation Assessment Diversity			0.529	0.652

Note. Applied rotation method is varimax.

It was found that the EFA factor rotation produced three latent factors along with their manifest factor composition (indicators). The formation of 5 maximum factors based on the eigenvalue results was rejected because the five factors formed still overlapped (grouping of manifest factors > 1 in the latent factor). So, we eliminated the overlapping factors and produced three fit latent factors with the justification for naming the factors and the cumulative contribution percentage attached in Table 8.

Table 8. Factor Naming and Cumulative Contribution Percentage

Formative Assessment Factors	Naming Factors	Cummulative Contribution Percentage
Factor 1	Formative Assessment Techniques	36.3%
Factor 2	Entrepreneur Affective Scale	48.5%
Factor 3	Readiness to Learn	57.9%

Formative assessment technique factor with a contribution percentage of 36.3%, the affective scale of entrepreneurship 48.5%, and learning readiness 57.9%. All available latent factors have a contribution of > 20% so that the exploratory factor analysis is declared successful (Tobias & Carlson, 2010).

CFA Test

We examined the EFA results to find the philosophical similarity of the composition of the manifestation factors to the latent factors. After careful review, we found that there were several manifestation factors that seemed less relevant where the diction was not yet able to explain the latent factors (although the factor loadings met the EFA criteria). See Table 9.

Table 9. EFA Manifest-Latent Factor Diction Review

No	Faktor Manifest	Faktor Latent	Information
1	Politeness	Formative Assessment Techniques	Tends to explain the affective diction
2	Prototype Final	Entrepreneur Affective Scale	Tends to explain the diction of assessment techniques
3	Implications for Future Formative Assessment Teachers Memory	Radiness to Learn	Number 3-6 is Doubtful (unobservable factor)
4	Students Courage		
5	Improvisation Assessment		
6	Diversity		

Several items of manifest factors need to be evaluated so they can be used to clarify the formative assessment construct of entrepreneurship subjects. Manifest factors that are identified in the dictionary as not accepted will be transferred to the reserve of suspected manifest factors to be continued in the second framework analysis. Then, we reposition the factors for the development of hypotheses and theoretical studies to form a fit model for the formative assessment construct of entrepreneurship subjects. The submission of the fit model to be analyzed at the CFA stage is complete in Table 10.

After factor repositioning, theoretical review and hypothesis development were submitted, we examined the CFA data to test the hypothesis of developing the formative assessment construct fit model. The CFA multivariate statistical assumption test was conducted with the results in Table 11.

MSEA value is 0.079, and CFI 0.914 means that the alternative hypothesis (H_a) is accepted, or the CFA model proposed has fit. Then, the latent factors develop into four based on the results of the eigenvalue and screeplot examination. For information, it seems that the unobservable factor that is released from the EFA test is “Feedback”. Remember (Table 6) that the results of the eigenvalue and scree plot of EFA are a maximum of 5 factors. So, the justification for the 4th or 5th latent factor needs to be done (Choi & You, 2017). Furthermore, if the repositioned manifest factors (results of repositioning and theoretical predictions of manifest-latent factors) that we conducted are not present in the CFA estimation factor table, then the manifest factors are eliminated (because the factor loading < 0.6). The best CFA outer model evaluation is seen in the following Table 12.

Final Interpretation

As explained in the mixed methodology transformative design, the first and second frameworks have different properties. However, a strong contradiction was only detected in IMA and EFA. When IMA and EFA are interpreted into the meaning of the mix methodology

convergent parallel design, it can be clarified how the qualitative and quantitative data in mutually supportive conditions, combined, and together formulate the formative assessment construct grid of entrepreneurship subjects precisely.

Table 10. Factors Reposition and Develop Hypothesis

No	Latent Factor	Items Manifest Factor	Source Of Reposition Theory
1	Formative Assessment Techniques	✓ Thinking Power	Rasmussen (2016)
		✓ Paper Test Essay	Fulmer et al., (2015)
		✓ Marketability	Welsh & Tullar (2014)
		✓ Oral Exam	Westbroek et al., (2020)
		✓ Product Uniqueness	
		✓ Product Funtion	
		✓ Multiple Choise Paper Test	
		✓ Keeping Promise	
		→ Prototype Final	
		→ Teacher Memory	
2	Entrepreneur Affective Scale	✓ Time	Marsaoli & Kusumasari (2022)
		✓ Reasoning Process	Rasmussen (2016)
		✓ Spiritual Quotient	Cagasan et al., (2020)
		✓ Helping Each Others	Boston (2002)
		✓ Leadership	Colombelli et al., (2022)
		✓ Willing to Sacrifice	Sulistiono et al., (2019)
		→ Politeness	
		→ Student Courage	
		→ Independence	
		→ Student Activeness	
3	Readiness to Learn	✓ Smile	Cagasan et al., (2020)
		✓ Class Environment	Fulmer et al., (2015)
		✓ Short Verbal Quizz	
		✓ Sensitivity of Learning Interest	
		→ Neatness of Student Notes	
4	Feedback	→ Neatness of Study Tables	
		→ Implications for Future Formative Assessment	Boston (2002)
		→ Emotional Inteligence	Grob et al., (2017)
		→ School Discipline Orientation	Black & Wiliam (2003)
		→ Student Motoric	
Information:			
✓	(EFA manifest-latent factors determination)		
→	(results of repositioning and theoretical predictions of manifest-latent factors)		
Hyphotesis:			
H ₀	: Outer Model Non-Fit		
H _a	: Outer Model Fit		

The formative assessment construct grid is quite mature in convergent parallel design. For example, the manifest factors are grouped in domains that can be measured empirically. However, the convergent results have not fully answered the research questions. Several considerations such as the manifest factors that are less able to explain the latent factors specifically, and there is a chance that “unobservable factors” appear in the eigen value and screeplot EFA. The explanation of the conjunction between the first and second frameworks can be seen in the following Table 13.

Table 11. CFA Multivariate Statistical Assumption Test

Assumption Test	Result	Decision
RMSEA	0.079	Fit Model
CFI	0.914	Fit Model
Eigen Value & Scree Plot	4	>1 (accepted)

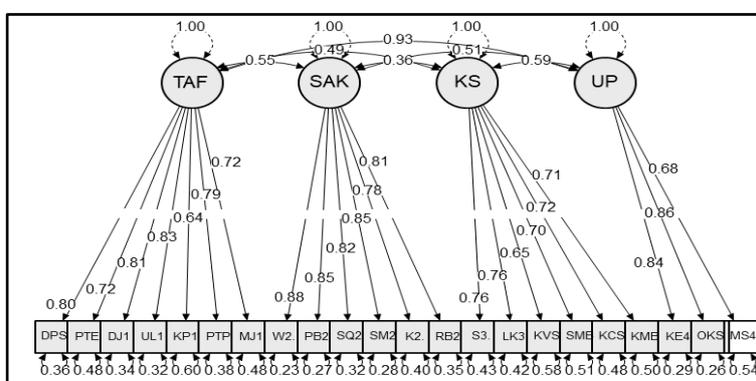
Table 12. CFA Estimate (Factor Loadings)

Factor Latent	Factor Manifest	Symbol	Estimate	p-value
Formative Assessment Techniques	Power Thinking	λ_{11}	0.669	<.001
	Paper test essay	λ_{12}	0.642	<.001
Entrepreneur Affective Scale	Marketability	λ_{13}	0.695	<.001
	Oral exam	λ_{14}	0.672	<.001
	Product Uniqueness	λ_{15}	0.608	<.001
	Multiple Choices Paper Test	λ_{16}	0.647	<.001
	Keeping Promise	λ_{17}	0.625	<.001
	Time	λ_{21}	0.807	<.001
Readiness to Learn	Reasoning Process	λ_{22}	0.830	<.001
	Spiritual Quotient	λ_{23}	0.806	<.001
	Helping Each Others	λ_{24}	0.821	<.001
	Leadership	λ_{25}	0.728	<.001
	Willing to Sacrifice	λ_{26}	0.762	<.001
	Smile	λ_{31}	0.896	<.001
Feedback	Class Environment	λ_{32}	0.912	<.001
	Short Verbal Quizz	λ_{33}	0.816	<.001
	Sensitivity of Learning Interest	λ_{34}	0.697	<.001
	Neatness of Student Notes	λ_{35}	0.703	<.001
	Neatness of Table Study	λ_{36}	0.765	<.001
	Emotional Inteligence	λ_{41}	0.710	<.001
	School Discipline Orientation	λ_{42}	0.733	<.001
Student Motoric	λ_{43}	0.704	<.001	

Table 13. Conjunction First and Second Framework

Characteristic	IMA	EFA	Covergent Parallel Design	CFA
Factor Analyze	Discovery and growth factors	Exploration initial factor composition	Creates conditions for proportional quantity of factor	Hyphotesis test
Composition of manifest factor	Adjust diction articulation	Random, ambiguous and slightly directional	The combination of IMA and EFA starts form subjective conjecture to become objective	Factor repositioning and theoretical studies
Latent factor construct	Not yet justified	Psychometric justification	Interrelation	Confimr H _a

Final confirmation is needed through CFA. We looks at the CFA plot model to examine the relationship between the latent factors of the formative assessment construct of entrepreneurship subjects. See Figure 3.



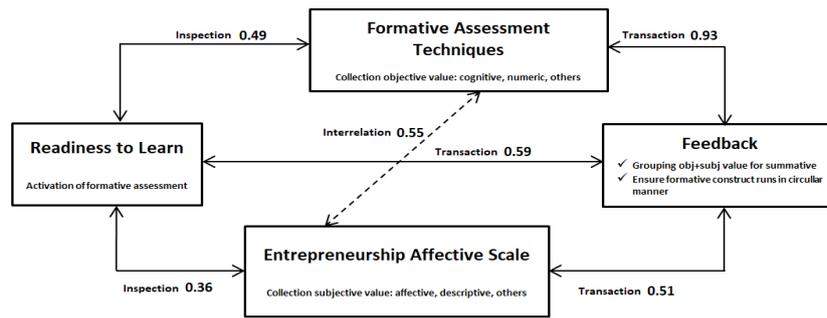
Note: TAF: Formative Assessment Techniques, SAK: Entrepreneur Affective Scale, KS: Readiness to Learn, UP: Feedback. Source: JASP Analyze (edit) 2024

Figure 3. Inner & Outer Model Plot CFA Second Framework

We examine how the formative assessment construct of entrepreneurship subjects works in the learning process. This examination is done by looking at the correlation value of the inner model between CFA latent factors in the second framework (especially Figure 2). If it is assumed that all latent factors have a correlation, then the magnitude of the correlation value contained can provide an understanding of the nature of formative assessment that is complementary between its construct units. Here, we provide arguments about the nature of formative assessment complementarity with the verbs “inspection, transaction, and interrelation”. See Figure 4.

We believe that the inner model of the formative assessment construct of entrepreneurship subjects has a hierarchy in its implementation. Starting from 1) readiness to learn, 2) formative assessment techniques and entrepreneur affective scale (or vice versa), and 3) feedback. When learning begins, the inner model moves in a circular manner relevant to the complementary nature of formative assessment (Black & Wiliam, 2003; Dunn & Mulvenon, 2009).

It seems that the central role of formative assessment in the learning entity of entrepreneurship theory and practice in the classroom can be visualized in Figure 5. The examination of the CFA inner model correlation and the linkage of the construct with other assessments (diagnostic and summative) is supported by the analysis of the citation results of relevant articles that support the movement of this formative assessment construct. A more detailed explanation can be seen in the discussions.



Source: Adaptation Model Plot CFA 2024

Figure 4. Visualizing How the Inner Model of Formative Assessment Works.

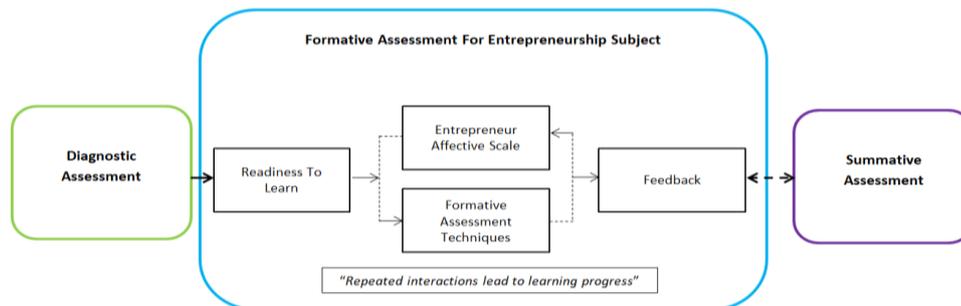


Figure 5. Centrality of Formative Assessment to Diagnostic and Summative Entrepreneurial Subject in High School

Discussion

What teachers understand about formative assessment in entrepreneurship subjects is how students have good attention and focus on learning during classroom learning. As explained by [Carreira \(2012\)](#), formative assessment is indeed created to stimulate students to actively respond to the transfer of knowledge content, attract their attention to the learning process and increase metalinguistic awareness. There is one unique finding where attention and focus on learning not only act as stimulation for students to start responding to learning materials but are considered the key to starting to implement formative assessment. This means that teachers want attention and focus on learning to exist, but without stimulation (attention and focus on learning), teachers are not sure whether they will assess formatively in the future. Teachers are very sensitive to this. They seem to want to be appreciated in the teaching and learning process, want to be noticed, and enjoy a solemn learning atmosphere.

Formative assessment is actually formulated freely as it is, regardless of whether or not there is a formative instrument arrangement, but this type of formative rubric formulation is felt to be able to increase their confidence in students' strengths (worthy/positive) in the learning session that will be faced. As concluded, adult educators (more senior teachers) have more freedom and flexibility in helping to formulate assessments of their students. Relevant to the statement of teacher 2 (SMAN 1 Teluk Bintan), "the teacher's ability to see the personal strengths of students during learning" has explicitly explained that they (teachers) are actually able to formulate more measurable formative assessments. However, more subjective things such as personal strengths, talents, and individual abilities are clearly difficult to measure. The measurement performance is quite opaque, considering that the student entity does not come from the same social background. So, the blending of the formative assessment rubric formula,

which seems "as is" and "instrument or non-instrument," is clearly a risk. The teacher's belief that "the formula listed can help understand the feasibility or positive side of students" does not necessarily provide significant student learning development. So, criticism of the formative assessment rubric formulation understood by teachers needs to be conveyed. They (teachers) must really know the positive side of students who deserve to be given credit scores, accompanied by an objective assessment of cognitive questions, then interpreted formatively. In line with [Glazer \(2014\)](#), educators must pay extra attention to ensure that assessment practices are not only meaningful for learning but also fair and consistent with respect to instructors, courses, years, and institutions.

Teachers believe that formative assessment is directed at assessing students' readiness and learning development, being "observant" in observing students and seeing students' learning progress recorded either directly (spontaneous, positive responses from teachers) or implied in the formulation of formative rubrics functioning as a tool that is able to assess students' readiness and learning development better. Monitoring students' learning development can be done by marking students' responses on how they are able to follow the flow of learning (learning progress, understanding the material, and good attitudes). As explained by [Jiang \(2014\)](#), markers of how students actively respond during formative assessment can be done by exploring questions as an assessment tool, checking the entire questioning process and ensuring that each stage meets learning objectives.

When the construct of formative assessment is examined from two perspectives (teachers and students) and seeing how its role is between diagnostic and summative, a tantalizing finding is obtained. The connection between diagnostic assessment and formative assessment lies in the latent factor of "Readiness to Learn" where "Regular diagnostic assessment can monitor students' learning development, starting from examining initial cognitive understanding to their psychological conditions that can encourage their readiness to continue learning" ([Fernández-Alonso et al., 2015](#)). Here, the diagnostic assessment is an assessment of the initial psychological and cognitive conditions of students, which also resonates with the manifest factors of "Readiness to Learn" such as Smile (λ_{31}), and Learning Interest Sensitivity (λ_{34}), which are the realm of psychological readiness. Then, the manifest factor of the Short Verbal Quiz (λ_{33}) is the realm of cognitive readiness. Furthermore, the manifest factors of Classroom Environment (λ_{32}), Neatness of Student Notes (λ_{35}), and Neatness of Study Tables (λ_{36}) are specific justifications for the latent factors of "Readiness to Learn" which seems to lead to the "preparation of learning devices (tools)" in ([Cagasan et al., 2020](#); [Fulmer et al., 2015](#)). Diagnostic assessment can actually be directly measured using the latent factor of "Readiness to Learn" if the diagnostic assessment form by the entrepreneurship teacher is not yet available. However, it should be emphasized that diagnostic assessment is a different measurement construct from the latent factor "Readiness to Learn" in the formative assessment construct. These two domains tend to be similar, but there is an additional justification for the next manifest factor, which is only available in "Readiness to Learn" (Classroom Environment (λ_{32}), Neatness of Student Notes (λ_{35}), and Neatness of Study Tables (λ_{36}): defining "tools") where the diagnostic assessment can't identify it.

The latent factor of "Readiness to Learn" towards the latent factor of the "Entrepreneur Affective Scale" lies in the "examination of learning readiness from teachers and students which can improve the performance of formative assessment" As expressed by [Carreira \(2012\)](#) that "grouping based on student's abilities, interests, learning styles, choices... draws their attention to the learning process and increases metalinguistic awareness" in the formative assessment of this examination is obtained when teachers want to see students learning readiness based on aspects of the affective scale of entrepreneurship. Teachers involve students' desired abilities, interests, learning styles, and choices (possible methods or content of entrepreneurship materials) to ensure that "Readiness to Learn" remains. In conclusion, "Readiness to Learn"

can be examined with the “Entrepreneur Affective Scale” but does not affect each other because the measurement constructs between these two latent factors are different.

Formative Assessment Techniques can check “Readiness to Learn” (inspection) similar to Dolin, Black, Harlen, & Tiberghien (2018) “Observing students as they work, asking questions to probe their understanding, listening to their explanations and engaging in short evidence-gathering dialogues (‘on-the-fly’)”. “Readiness to Learn” examination through “Formative Assessment Techniques” can be done; this is reinforced by the manifest factor of “Readiness to Learn” Short Verbal quiz (λ_{33}) can also be utilized by teachers in “Formative Assessment Techniques” if they want to collect objective values (scores) along with monitoring understanding, listening to explanations, and short dialogues during the learning process. The difference is that in “Formative Assessment Techniques”, the assessment of cognitive-psychomotor aspects can be clarified in the form of collected objective values (in the form of numeric scores), but Short Verbal Quizz (λ_{33}) are in the form of simple questions and answer sessions that are inconsistent at times or whether they question the cognitive or psychomotor domain. The “Readiness to Learn” examination through “Formative Assessment Techniques” can be done using a simple, short and flexible quiz method that follows the flow of learning.

“Formative Assessment Techniques” are different from the “Entrepreneur Affective Scale”, but the use of both functions can be done together (interrelation) (see Figure 3). This finding was obtained from the results of the study by Rasmussen (2016): “Formative can certainly assess (for example, creativity, innovativeness, and prototyping) with more objective parameters, but it does not rule out the possibility that this assessment is biased towards teacher responses to entrepreneurial values displayed by students in class”. The condition of interrelation between “Formative Assessment Techniques” and “Entrepreneur Affective Scale” is exchanging information on the effectiveness of collecting objective and subjective values that will be transferred to “Feedback” or inspection processes to keep “Readiness to Learn” active when viewed from the inner model.

Repeated interactions on formative assessment constructs result in significant learning progress. Learning progress obtained when formative assessments are implemented is repeated interactions on each latent factor available in the formative assessment construct as explained by Chróinín & Cosgrave (2014): “Formative assessment is defined as ‘frequent and interactive assessment of students’ progress and understanding to identify learning needs and adjust instruction appropriately’”. If formative assessment has been implemented, then each latent factor performs its function fully and will get a significant surplus of learning progress for appropriate learning and teaching needs. Last, “Feedback” ensures that the construct interacts circularly (Bin Mubayrik, 2020; Glazer, 2014), collection of subjective and objective data so that it can be used as a consideration for evaluating the learning process (Broadbent et al., 2018), and the transmission of formative “Feedback” on “Summative Assessments” as a decision-making tool for student graduation (Bhat, 2020).

CONCLUSION

Teachers' understanding of formative assessment is quite diverse. Namely, formative assessment examines how students have good attention and focus on learning during classroom learning in the form of a free assessment rubric formulation, leading to the assessment of student readiness and learning development. The results confirm how the formative assessment construct can work and that there is a central relationship between diagnostic and summative assessment. Examination of the inner and outer models supports the complementary nature of formative assessment, and repeated interactions between latent factors of formative assessment can produce learning progress in the learning atmosphere. However, there are limitations that need to be conveyed. First, EFA data together with CFA need to be examined on observation samples with higher quantities (the number of samples increases from EFA to CFA), and there

are differences in momentum in them (for example, for EFA and CFA testing in different school years). So that the examination is not in the same time momentum or learning cycle, this needs to be considered to meet the reliability of the formative assessment construct. Second, visualization of the formative assessment construct is limited to examining the Pearson correlation displayed in the inner model of the results of the second framework (CFA). Therefore, the examination (inner and outer model) needs to be done explicitly again. The examination is comprehensive, including reading the measurement and structural models between types of assessment (diagnostic, formative and summative). Structural Equation Modeling (SEM) is recommended to translate this visualization to be clearer.

Conflict of interests

There are no known conflicts of interest associated with this publication.

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